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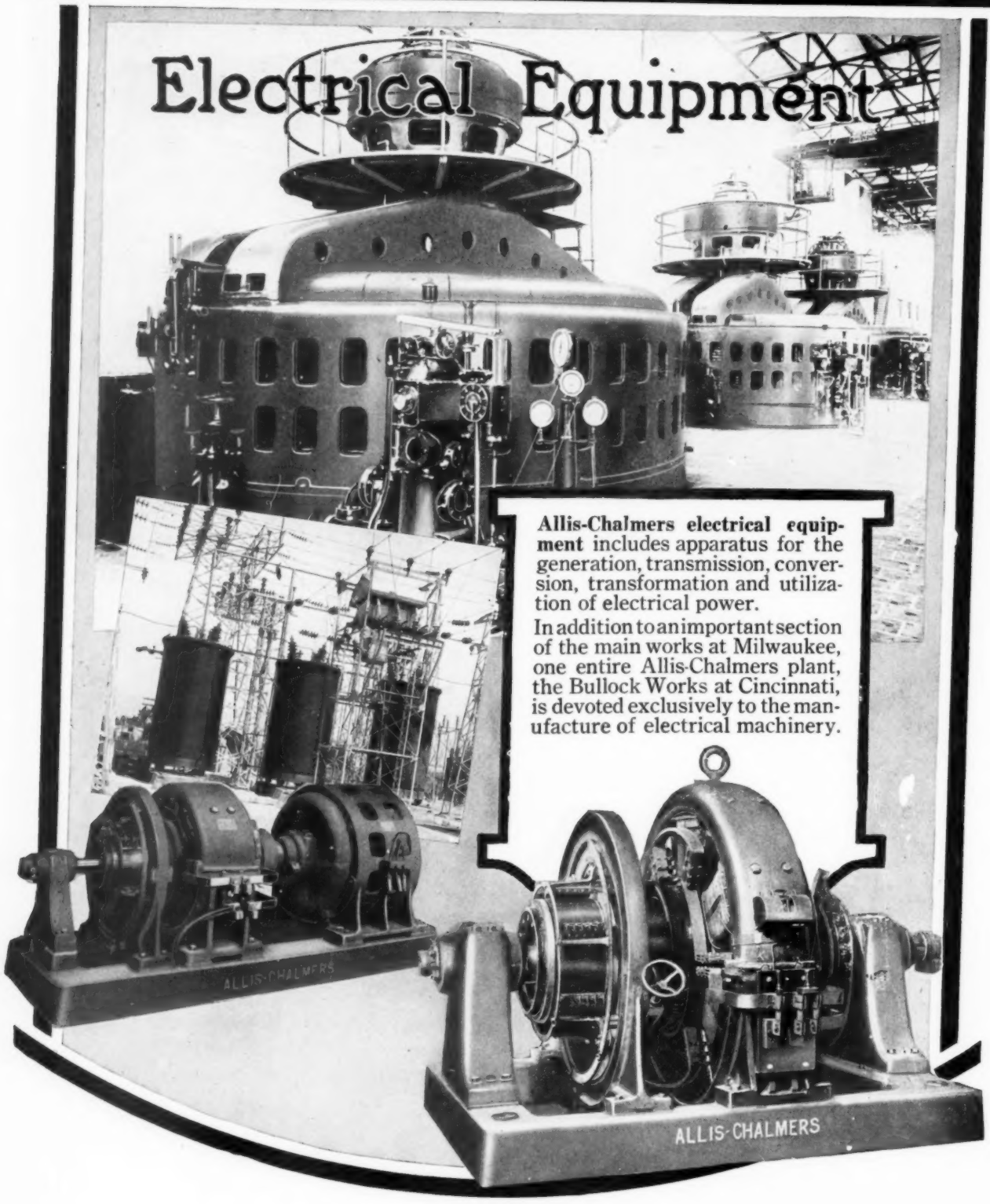

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VOL. 74.—No. 8. CHICAGO, SATURDAY, FEBRUARY 22, 1919.

Fig. 1.—Central Fire-Alarm Station, San Francisco, Cal.

Central Fire-Alarm Station of San Francisco

Unusually Complete Equipment and Many Unique Features to Guard Against Fire Hazard—Special Provision to Insure Reliability of Power Supply and Interchangeability of Circuits—Method of Operating

THE central fire-alarm system of San Francisco, Cal., is not only housed in an unusual building but possesses many unusual and novel features. The lesson of the disastrous conflagration that practically wiped out the city in 1906 was that every effort must be made in fire prevention to eliminate any possibility of the occurrence of another such catastrophe. This explains many of the unique features of the station.

The building is of reinforced concrete and is fireproof, earthquakeproof, mobproof and burglarproof. In order to eliminate all fire hazard being communicated from outside sources, the building is located in Jefferson Square, a small public park, and no buildings are permitted to be constructed within 400 ft.

Architecturally, the building is very pleasing and an ornament to the park. It has but one story and basement and is about 65 ft. square. The main operating room occupies almost the entire first floor with the exception of a small private office, a small room occupied by the telephone operator, a kitchen and lavatory.

There are no windows leading into the main operating room, all daylight coming from the skylight seen in the general view, Fig. 1. This skylight is double, the lower one forming a large attractive panel in the middle of the ceiling. All skylight framework is of steel and sheet metal, and all glass in the skylight is of heavy wired type. Ventilation is provided by louvers extending entirely around the skylight. The surrounding roof is of red tile. The exterior of the building is finished with cement plaster applied by the "cement gun" process. The entire station presents a most pleasing appearance, being beautifully ornamented on all sides with flowers and shrubbery. The entrance is lighted by two electric lamps mounted on ornamental iron posts.

INCOMING CABLES AND TERMINAL RACK.

All cables from the 820 alarm boxes terminate at a point in the plaza on the east side of the building, and on Turk street immediately in front of the entrance. There are two manholes at each of these points. From these two points the cables lead to the terminal rack, which is centrally located in the base-

ment. From the terminal rack the cables are distributed to the main operating board.

The cables from the various alarm boxes are carried to the station in conduits of the telephone companies, the high-pressure piping system ducts and the ducts of the Department of Electricity. The cables

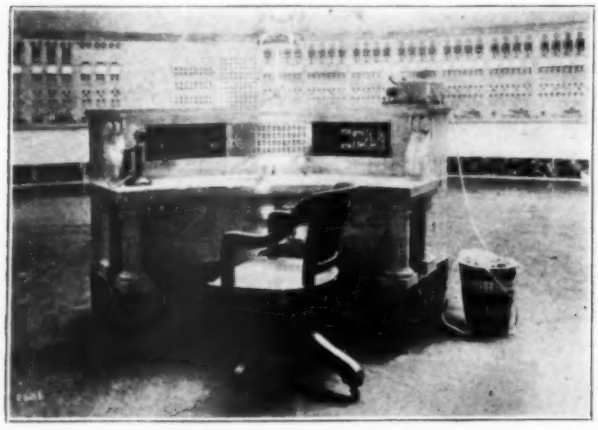


Fig. 2.—Central Portion of Main Operating Board with Chief Operator's Desk in Foreground.

carried in the high-pressure ducts were installed in the same trenches and at the same time as the high-pressure water pipes. These ducts were of creosoted wood, 4½ in. square, with 1½-in. creosoted cover planks.

The terminal rack in the basement of the station is mounted directly over the cable pit. There are three runways for the distribution of the wires from the rack to the main board. These runways consist of troughs of angle iron and wire screen.

Main Operating Board.

The main operating switchboard seen in the back of Fig. 2 comprises 41 panels, is semicircular in form, 102 ft. in length, and divided into three sections. The wires are distributed to these three sections by the three runways referred to, each runway supplying one section. The operator's desk seen in the foreground of the illustration, is centrally located so that every instrument on the main operating board is always within his vision.

All instruments on the switchboard, with the exception of the registers and meters, were constructed in the shops of the Department of Electricity. The switchboard is now equipped with 48 box or signal circuits (there being four to each panel). Not all the switchboard panels are equipped at the present time; there are 9 additional panels to be equipped with additional box or signal circuits as extra circuits become necessary.

Box or signal circuits occupy that space on the switchboard (see Fig. 2) extending from the clock toward the right, 7 panels being shown in this view. To the left can be seen some of the panels carrying the so-called "hospital" circuits. To the right of the hospital circuits can be seen a panel which is yet to be equipped with 3 hospital circuits, which will be added as necessity arises. There are now 5 panels devoted to the hospital circuits, these circuits taking care of other lines in case of trouble, such as open lines, grounded lines, and lines crossed up with outside circuits. When any of the signal circuits, joker circuits, or tapper circuits are out of order, they are switched over to the hospital circuits, which are supplied with the necessary current from a motor-generator set, one such machine being supplied for the 3 hospital circuits on each panel. Fig 3 shows a near view of part of the hospital panels. The motor-generators are mounted on a slate panel back of the main switchboard and are shown in Fig. 4. They are of General Electric make, operating on 120 volts.

In Fig. 2 immediately to the right of the vacant hospital panel can be seen two terminal panels, one for handling the signal lines and one for handling tapper and joker lines when any of these lines are to be transferred to the hospital circuits. These terminal panels are provided with jacks, cords and plugs for plugging in when connections are to be made. The jacks are connected with the line terminals, and the cords and plugs all connected with the hospital panels.

By means of these transfer connections and the hospital equipment the grounded or crossed lines can be entirely isolated and connected to a panel provided with special equipment for testing and treatment of crippled lines.

The hospital circuits and the terminal panels are capable of taking care of 3 tapper and 3 joker and 6 signal circuits at one time, which is usually sufficient to take care of all lines that are out of order. Most of the trouble in San Francisco is caused by wind storms, there being no ice, snow, or similar conditions to contend with.

When it is desired to connect a line with the hospital line, the line switch is thrown for a terminal panel connection, then the hospital panel is connected by using the plug and jack.

There are three panels on the left of the main switchboard devoted to tapper signal circuits (there being 10 circuits now in operation, with room for additional installations in the future), and three panels devoted to joker signal circuits of which there are 10 now in operation, with room for additional installations.

At 8 o'clock in the morning, 12 noon, and 6 o'clock in the evening, 3 blows are struck on the joker and tapper circuits merely as a time test. The joker circuits are available for handling not only the alarms

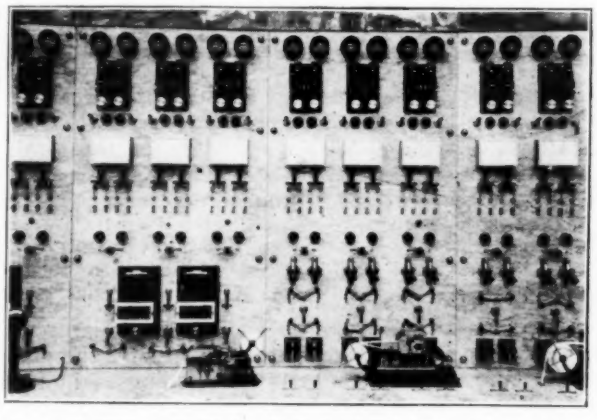


Fig. 3.—Closer View of Another Portion of Main Board, Showing Several "Hospital" Circuit Panels.

of fire as an auxiliary, but also all other calls, such as special calls for high pressure, extra engines, trucks, and other apparatus, in and out of service, etc.; their principal use, in fact, is for such departmental calls.

The motor-generators for the tapper and joker test sets are mounted on a horizontal slate panel,

located back of the main switchboard. The tapper and joker generators are of the Holtzer-Cabot type and operate on 115 volts.

In the construction of the main switchboard, Vermont electric blue marble was used for the switch panels and shelves for the registers. These shelves are 1¼ in. thick, 18 in. deep by 30 in. wide. The panels are 1 in. thick, 30 in. wide by 4½ ft. high. The entire board is capped with yellow Sienna marble. The facing is of white statuary marble and the base is finished in verde antique, this combination producing a very pleasing and harmonizing effect.

The iron frame supporting the switchboard is cemented into the concrete floor, making it absolutely rigid, and the semi-circular form of the board makes it self-sustaining. Access is had to the space back of the board by means of steel doors. Here there are connections for portable lamps and for electric soldering irons, making it very handy to make repairs.

The entire floor of the main operating room is covered with a very heavy linoleum, which permits quiet and comfortable walking with freedom from stirring up dust. The main operating room is well lighted at night by a semi-indirect lighting system with ornamental bowls. A switch is provided by means of which an emergency lighting circuit on the ceiling can be operated from the storage batteries.

Storage Batteries and Charging Facilities.

The source of power for operating the circuits on the main switchboard is a duplicate storage battery of 280 ampere-hour capacity installed in a well ventilated acidproof room in the basement, see Fig. 5. There are two sets of batteries, one set being held in reserve. The battery drives dynamotors, through which power is furnished to the various circuits. Each dynamotor supplies current for four circuits. This arrangement was made for the purpose of more thoroughly insulating the lines from each other and also the battery from the ground.

The batteries can be charged from the direct-current mains or the alternating-current mains of the two different power companies. Three panels located back of the main switchboard (see Fig. 6) are devoted

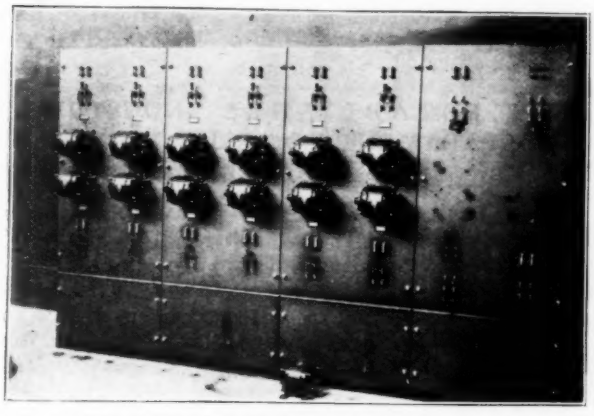


Fig. 4.—Motor-Generators for the Signal Circuits—Slate Panels Back of Main Board.

to the supply current distribution and the charging of the batteries. Most charging is done by floating the idle battery on the direct-current mains, the other battery working the station circuits in the meantime. A motor-generator is used for charging from the alternating-current source.

For use in case of emergency, a Fairbanks-Morse 20-hp. gasoline-engine-driven generator (Fig. 7) has been installed, for supplying current to the battery and lights for the building. Large storage capacity for fuel and water will enable this equipment to operate for a long period, without being supplied with addi-

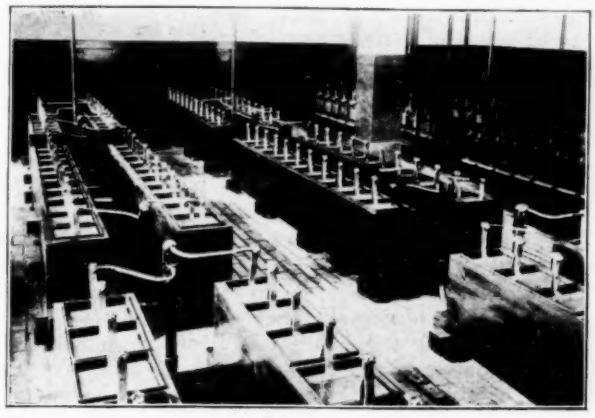


Fig. 5.—Storage Batteries in Separate Room in Basement of Station.

tional supplies. In order to eliminate any fire hazard from the gasoline engine, it is separated from the rest of the basement by a 10-in. reinforced concrete wall.

General Scheme of Operating.

All alarms from street boxes are received at the central fire-alarm station on telegraph sounders and registers. These can be seen in Figs. 2 and 3. The street fire-alarm boxes are arranged to sound in their numbers four times. After two rounds are sounded, the box number is checked on a list by the operator at the board, and instantly the operator at the desk calls out the number as he hears it. The operator at the board checks and repeats the number. Immediately the operator at the desk, whose duty it is to send the alarm to the engine houses, sends out the alarm twice over the tapper circuit and twice over the joker circuit, and all fire houses that respond to that number immediately go to the fire.

When the battalion chief reaches the fire, he, or his assistant, calls the central fire-alarm office by means of a regular telegraph service key and sounder, which are located in each fire-alarm box. The battalion chief calls for additional engines, chemical wagons, the high-pressure service, etc., by sending in to the central fire-alarm office the code telegraph signal that will provide him with whatever is required, and the operator at the central office orders out the engines or chemical wagons, or notifies the high-pressure station, whichever may be the case, by sending the proper signal on the joker lines.

On arrival at the street box the battalion chief puts the fire-alarm apparatus in service again. The boxes are equipped with clock mechanism and a character wheel, and by pulling the hook, the mechanism is released, and the character wheel that sends in the alarm revolves four times before stopping. The box system works on a closed circuit and the character wheel in rotating breaks the line circuit, thus operating a relay in the fire-alarm office, which in turn operates the local circuit. There are 48 incoming circuits, and the smallest number of fire-alarm boxes on any one circuit is 4, while the largest number is 40, but the average number is 20.

The box number is shown on an illuminated box list. This list is illuminated only when an alarm is coming in. This box list is removable, and is transferred to the hospital set, when the corresponding circuit is to be switched to the hospital set. A pilot light is placed just above this box list, which operates in unison with the register, flashing the same code, and calling attention of the operator in case he should fail to hear the sounder.

Each fire-alarm box is pulled regularly once a month for a test, at which time it is rewound. Boxes can send in 15 or 16 alarms, without requiring rewinding. All boxes are rewound as soon as they have been pulled 3 or 4 times.

There are two electric clocks in the station, one located on the main switchboard, and the other on the operator's desk. Both clocks work together, being regulated from the master clock in the Ferry Building. The station is equipped with two Weston station voltmeters for testing the lines.

At this desk there is a telephone connected with all fire houses, pump stations, and all other departments of the Fire Department. This telephone is connected with these departments through a switchboard located in the building, manned by a special operator at all hours. Immediately to the right of the telephone, in Fig. 2, there is a power switch for controlling the current for operating the office. This enables connection to be made from either outside source or battery. This switch controls the current for operating outgoing signals and the combination permits the connection with the service of the outside direct current or the battery service within the building, also the current from the motor-generator set operated by either of these two services. By means of the two striking keys seen at the extreme right of the desk and the jack and plugs seen in the center of the desk, the operator can make connections, and handle all signals from this desk when necessary, but

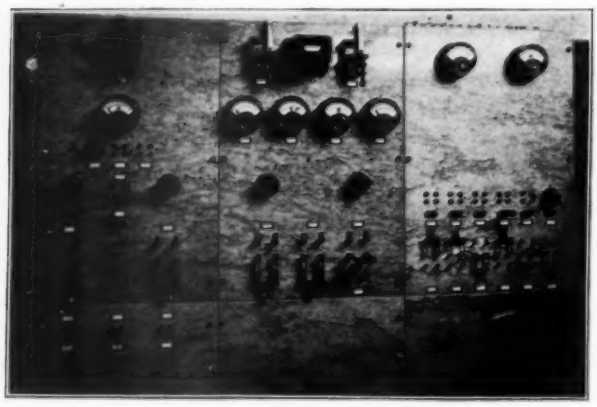


Fig. 6.—Charging Panels Located Back of Main Switchboard.

usually the signals are handled by the operator at the main switchboard, and the desk operator handles the signals in this manner only when the operator at the board is very busy. The main striking key for sending out all outgoing signal alarms can be seen on the desk a few inches to the right of the two plugs. All signals sent out are recorded on the two registers attached to the top of the desk.

There are 6 crossing signals in two circuits on Market street, the city's principal street, which are used in case an alarm is turned in from that particular neighborhood, or from a neighborhood which will require the apparatus to cross Market street, or make a run up or down Market street.

The warning bells are mounted on the lighting poles, and are operated by remote control, handled by a switch in the central fire-alarm office. The bells continue to ring for a length of time required for all the fire apparatus to either cross Market street, or to make the run up or down the street, as the case may be. On all first alarms, the bells sound for 3 minutes,

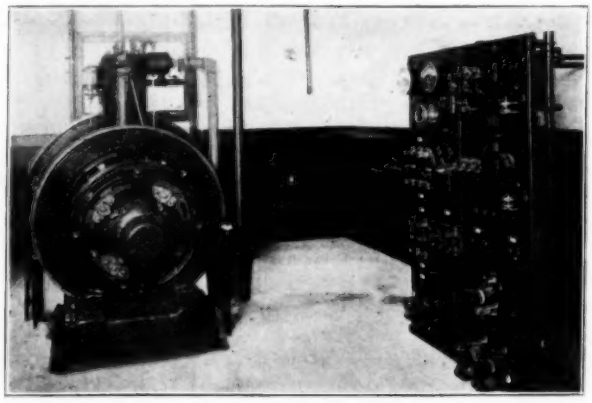


Fig. 7.—Special Charging Generator Connected to Gasoline Engine—At Right Is Control Panel for Same, Also for Motor-Generator Charging Set in Other Part of Basement.

for second alarms 4 minutes, third alarms 6 minutes, and fourth alarms 8 minutes.

When these bells sound all traffic clears the streets. All pedestrians remain on the sidewalks, and the traffic officers or other policemen see that all vehicles are in such a position as to give the coming fire apparatus the right-of-way.

An alarm bell is also located at the Third and at the Fourth street bridges, to warn the bridge tender in case any fire apparatus intends using the bridge; when this bell sounds, the bridge, if in raised position, is lowered as soon as possible, and if it is down, it is not raised until all the fire apparatus has passed.

The central office has been in service over three years with completely satisfactory results. The entire San Francisco fire-alarm system is probably the most complete and most thoroughly safeguarded that has ever been installed. It therefore continues to be a model for other cities.

BANK ESTABLISHES INDUSTRIAL DEPARTMENT TO ASSIST MANUFACTURERS.

The Liberty National Bank of New York City has created an Industrial Department for the purpose of offering its service, in an advisory capacity, on matters pertaining to manufacturing and industrial problems. The establishing of this department is due to what might be considered an industrial reorganization brought about by the war conditions and it is expected that a closer relationship between the industrial customers of the bank and its officers will result.

The new work will be directed by Donald D. Davis, whose experience in engineering, accounting and factory work should prove helpful to manufacturers in the solution of their individual, technical, manufacturing problems. These problems are especially prominent at this time of readjustment and as most of them relate, in some manner, to the financial aspect of the situation, the value of such an institution is evident.

Electrical Equipment of New Pacific Coast Flour Mill

Successful Mill at Pasco, Wash., Is Very Completely Equipped Electrically—Labor-Saving Methods Promote Marked Economy

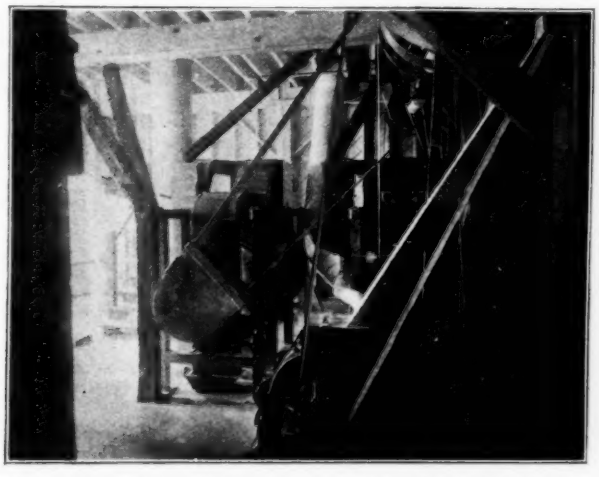
THE Pasco Flour Mill Co., organized in 1916, at Pasco, Wash., attributes the great success which it has achieved in a comparatively short time chiefly to the fact that its officers have been closely identified with the flour-milling and grain business of the Pacific Northwest for the past 30 years, and to the wisdom of locating the mill at Pasco, which is in the heart of the best wheat-producing district of Washington and Oregon, with unexcelled transportation facilities. Wheat of the proper varieties and grades can be secured readily to make the various grades of flour demanded by the different sections of the country. The soft white wheat for making flour so much in demand in the southeastern and southern states, and the strong variety for the Pacific Coast states, can be secured at all times on account of the splendid location of the plant. The location is also favorable for the distribution of the mill's products to all markets. Another secret of the mill's success is its modern electrical and mechanical equipment which has effected much labor saving.

Soon after the organization of the Pasco Co., plans for the plant were submitted and actual construction was immediately begun. The plans anticipated a two-unit flour mill with ample warehouse and elevator facilities for a 1000-bbl. plant. At the beginning it was planned to install only one unit at a time, and to operate only the first unit until increased business called for additional capacity. However, the first season was an exceptional one, so the second unit was begun soon after the completion of the first and by Feb. 1, 1917, the entire capacity of the mill was in full operation, day and night.

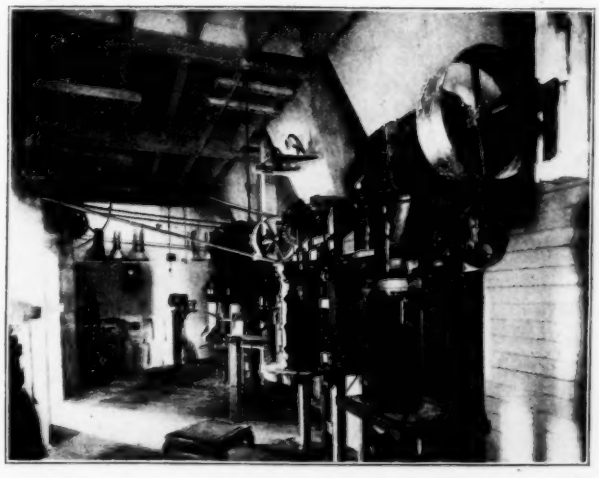
All motors are equipped with the latest safety appliances to insure absolute safety in operation and eliminate all hazards from fire. Eight Westinghouse motors, ranging in size from 2 to 100 hp., drive the machinery for the entire mill. The wiring for both power and light is entirely in metal conduits.

The rolls, sifters and purifiers of the first unit are of the Barnard & Leas Manufacturing Co., of Moline, Ill.; the second unit was equipped by Nordyke & Marmon, of Indianapolis, Ind. The cleaning machinery consists of two Prinz & Rau separators and two Monitor scourers, manufactured by the Huntley Manufacturing Co., of Silver Creek, N. Y., and the latest improved Wolf-Dawson wheat washer, manufactured by the Wolf Co., of Chambersburg, Pa.

In the so-called wheat end of the mill, five stands of elevators with a capacity of 175 bu., a Prinz & Rau separator, one 16-ft. 9-in. conveyor, two Monitor scourers with a capacity of 200 bu., one Williams grinder, one Wolf-Dawson scourer with a capacity of 175 bu., and one 9-in. dampening conveyor and blender are operated by a 40-hp. slip-ring type CW motor.



View of Two Monitor Scourers and a Williams Grinder Operated by a 40-hp. Westinghouse Slip-Ring Motor.

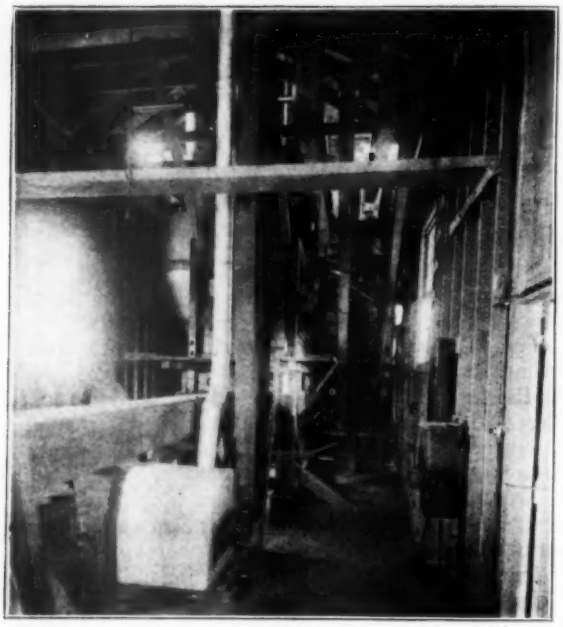


Direct View of the Two Flour and Two Wheat Packers in the Pasco Flour Mill.

The wheat received for milling is handled directly from the cars to the elevators, while the transfer of wheat and flour to the warehouse is accomplished by electrically driven portable elevators.

An unusual scheme is used to move cars on the track switch, back and forth to different loading and unloading doors in the warehouse. A countershaft extension from the main shaft in the mill has a steel drum attached to the end that projects to the platform. Wound on this drum is a 1¼-in. rope which is hooked to the car intended for moving. The direction of the pull from the drum is made by changing the wind of the rope on the drum. This scheme has increased the unloading capacity from four cars to six cars per day. One 40-hp., 440-volt, three-phase, 60-cycle, 1700 r.p.m. type CS motor, with complete starter, overload and no-voltage release, drives the main shaft.

Connected to this shaft is a 3-ton-per-hour steam

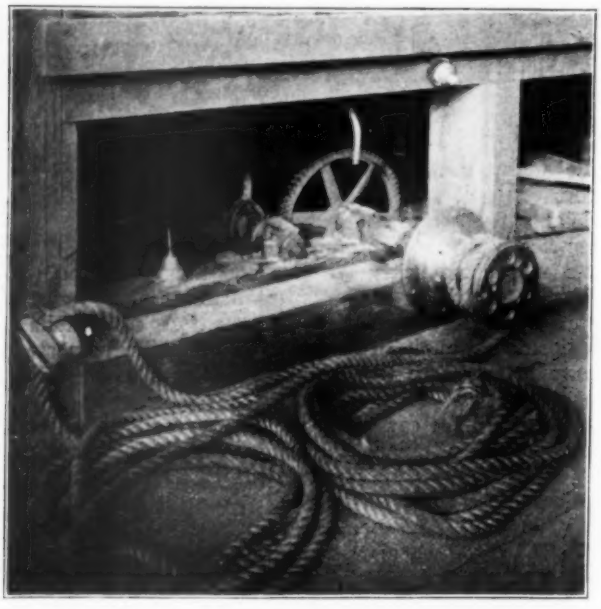


A 15-hp. Motor Operating a Prinz & Rau Separator, Two Stands of Steel Elevators, and One 36-ft. 9-in. Conveyor.

barley roll with a cleaner and three elevators. From the same drum described above, a power scoop is operated in unloading cars of bulk wheat into the bulk elevator hopper, unloading 1200 bu. per hour. Two men using the scoop do the work ordinarily done by six men scooping by hand, and the cars are thoroughly emptied. It is also planned to use the same motor to drive a belt conveyor from the warehouse to the bulk elevator hopper, and thus save the labor and expense of trucking sacks of wheat there for storage. This will save two cutters (men who open the sacks and pour the wheat into the hopper) and four truckers.

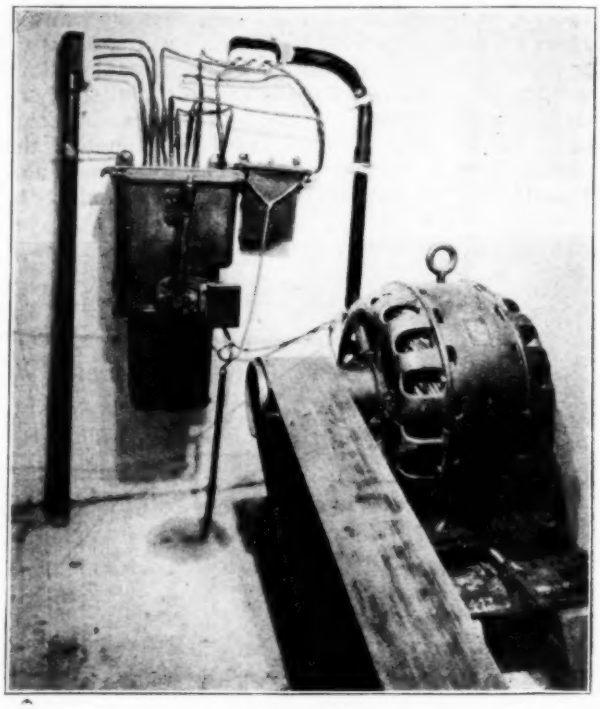
The wheat is conveyed from the elevator to the mill by a 36-ft. 9-in. conveyor, operated by a 3-hp. type CS motor running at 1155 r.p.m.

When the company began to operate, all the piling of loaded wheat sacks or even empties was done by man power, using a block and tackle. The same method was also used to unload wheat from the cars to the warehouse. Since then the company has installed a piling machine that piles any size sacks from 24 to 140 lb. This machine is of steel construction and can pile as high as 16 ft. Four men (one man on the pile and three truckers) can pile 800 bbl. in four hours with this piling machine. By the old operation it would take six men approximately ten hours to do the same work. This machine is operated by ⅓-hp. motor, with speed of 1130 r.p.m.



Drum for Moving Cars on Switch—Drum Is Attached to Countershaft Extension and Driven by 40-hp. Motor.

Reference should be made to at least one more example to show how thoroughly the Pasco mill is equipped with modern, up-to-date machinery. A McCahey "sure count" truck counter, manufactured by the J. J. Ross Milling Co., is installed on the floor of the warehouse entrance and is used to count the sacked wheat and flour coming into and going out of the warehouse. The truck on entering or leaving the warehouse runs over this counter, pressing a rod which is connected to an indicator, thus registering the load. This saves time and insures accuracy.



Westinghouse Type CS Motor, 40 Hp., 440 Volts, 3 Phase, 60 Cycles, 1700 r.p.m., Complete With Starter, Overload and No-Voltage Release, Used to Drive Main Shaft.

N. E. L. A. INSTITUTES EMPLOYMENT BUREAU.

The National Electric Light Association has never felt that it was one of its duties to serve as an employment bureau. Of late, however, a somewhat new condition has arisen as to men of higher grades in education and experience, and in regard to whom inquiries have reached the Association alike from such men and from member companies. The N. E. L. A. has therefore been authorized and instructed to maintain at its headquarters a record showing the qualifications of available men as filed by themselves, who are able to fill executive, administrative and supervisory positions with member companies of the association.

Farm Lighting as a Field for Small Storage Batteries

Storage Battery an Important Adjunct to Rural Lighting Plants—To Get Best Results From Battery Use It for Light Loads and as an Emergency Reserve Only — Proper Care

By GEORGE W. HILL

STORAGE batteries have been looked upon as a very important factor in farm lighting plants by many manufacturers. While they play an important part in the makeup of such plants for farm use, it is the opinion of the writer that the storage battery should be to the farm lighting plant just what it is and generally has been to the city lighting and power plants—an auxiliary to be drawn upon to take care of the peak of the load and also to be called upon in an emergency.

The storage battery has well known practical limitations as to current output and duration of time during which this output may be depended upon. Long experience with storage batteries has shown that they function best to supply the entire current at a time when the current demand is small, so that the battery discharge rate is comparatively low, or to supply the peak or excess current when the generators are temporarily called upon to produce current in excess of their safe capacity.

We are therefore brought face to face with a problem of engineering in farm lighting plants similar to and of no less importance than that of determining and providing means for taking care of the maximum demand made upon plants operated by some of the larger public service corporations. This is the problem of determining when a storage battery should be cut in manually or automatically to help the dynamo take care of the load. This also brings up the question of economy in operation.

It is a known fact that in transmitting power from engine to generator and from generator to storage battery and then to lamps or motorized or other electric consuming devices there are several problems of no small importance to be dealt with, such as loss in transformation of mechanical to electrical power and the losses incident to generation, transmission and storage of electrical energy.

To eliminate as much as possible the losses sustained in the transformation of mechanical to electrical power the direct-connected outfits were brought out, which practically solved the transformation problem. The next important thing which should receive the untiring efforts of the experts who are working out these combinations is the efficiency of the generators and the care, operation and durability of the storage battery. Efficiency is a strong feature in the design and construction of the larger units, and should naturally be of little less importance in the smaller ones.

There is no question but that the small generators constructed recently are much more efficient and dependable in every particular than they were some years ago, notwithstanding the fact that the principles employed in producing direct current have not changed in the past thirty-five years. Considerable improvement has been made with respect to the durability and operating features of the small dynamos through use of such improvements as ball bearings, etc., and this has brought about a condition whereby the armature can be run with safety much closer to the field poles which naturally increases the capacity and efficiency of the dynamo. There is one concern manufacturing a farm lighting plant which claims that it has only 1/32 of an inch air gap in its generator. This is due to the fact that it employs heavy ball bearings, with no side pull on the pulley, such as would be the case if this or the generator were being driven by means of a belt. So we see as we get into the problem of farm lighting that the principles, both mechanical and electrical, are pretty much the same as those employed in the larger electrical plants of the country.

Storage Batteries for Farm Lighting Plants.

There have been developed thus far only two practical types of storage batteries for commercial use; one is the lead plate-acid type and the other is the nickel-iron-alkaline type, commonly known as the Edison battery. The lead type of battery is divided into two distinct classes, whose elements and general characteristics are identical, but the manner of construction is different. These are the chemically formed or solid lead plate type, and the pasted or grid plate type. The features of these types were discussed in the preceding article of this series. The pasted type is much the cheapest storage battery to produce. If it had not been for the development of the pasted type it would have been very difficult to introduce the storage battery for farm lighting plants. Batteries of the solid plate or chemically formed type are usually shipped in dry or knocked-down condition and require an initial charge of several days in order to place them into service. This would mean running the gasoline engine continuously for something like 75 to 100 hours, which is a very trying task for any gasoline engine.

The pasted type of battery therefore found favor among both the manufacturers and the dealers, for with the manufacturer the cost of production was much reduced, and with the installer the trouble and inconvenience incident to the installation of the former type of battery was eliminated. The pasted plate batteries are usually shipped in sealed rubber or glass jars and are charged ready to give service immediately upon installation.

It is true, however, that the pasted plate battery is much shorter lived than the solid lead plate or the Edison nickel-iron batteries, but this is compensated for by the fact that they cost less to produce and therefore they sell for less. Dollar for dollar, there is

very little difference to the user, as the one costs less and is relatively short-lived and the other costs more and lasts longer.

The greatest danger in the use of the pasted-plate battery with a farm lighting plant is that of charging the battery at too high a rate in order to shorten the running hours of the engine and generator. This is very severe on such a battery as the violent gassing near the end of charge tends to tear the active material from the plates.

The writer fails to see wherein there is any economy in generating current, putting it into a storage battery and then taking it out of the battery to operate lights or motors to a very great extent. The wear and tear will be much less on the engine and generator than upon the storage battery through the latter being charged and discharged abnormally. Therefore, he fails to understand why some manufacturers of farm lighting plants should so design and construct their plants that the storage battery becomes the main power source of the plant most of the time, which is the exact reverse of the principles employed in all the modern, efficient efforts to use a battery in conjunction with an engine and generator in a large plant.

The most ideal conditions have been conceded to be that where a storage battery was installed it should be depended upon to take care of the load during low load periods only and when the load exceeded a certain maximum the engine and generator are started up to carry the load directly. Bringing this down to a concrete example, let us assume that a farmer's wife desires to operate an electric iron. The ordinary domestic iron consumes approximately 600 watts, or at 32 volts approximately 19 amperes current, which is much more than a normal discharge rate for a small farm lighting battery. She possibly irons four hours. How much more economically she would do this ironing if she would step to the basement, start up the plant and use the current direct from the generator to heat her iron instead of dragging the current out of the battery at a high rate of discharge, shortening the life of the battery and operating the entire plant in the most expensive manner, since the efficiency of utilization can never be as high indirectly from a battery as direct from the generator. Again, suppose she wished to run a washing machine five hours. She could start the plant up and operate her washing machine by belt direct from the engine pulley or, if it is an electric washer, direct from the generator, and incidentally during the time charge the battery at a slow, even rate. The battery should be used only when up to perhaps 7 to 10 lights would be burning, which would amount approximately a 4 to 7-ampere discharge rate.

Many manufacturers and dealers hooted at some of us old fellows who claimed the life of a pasted-plate battery operated under the most ideal conditions was about 300 cycles, but some of us have lived to hoot back at them. The writer's advice is: use the battery only for small, reasonable discharges, or in an emergency, and you will have solved one of the greatest problems of farm lighting plants. Several concerns manufacturing farm lighting plants recognize this fact and they have so designed their plants that a large majority of the small machines usually found on a farm may be operated direct from the engine pulley or in connection with a lineshaft and governor pulley. One manufacturer has so constructed his engine that the compression may be released for starting, thus allowing the engine to be turned over freely; then after moderate speed has been attained the compression release lever is closed and the momentum of the flywheel carries the piston against the compressed gas, the engine fires and runs. This eliminates the heavy discharge of the battery in starting the engine against the compression.

It is well enough to say that a pasted-plate storage battery constructed this or that way will produce wonderfully different results, but the fact remains that all pasted-plate batteries have the same elements and are assembled in about the same standardized way. It is not so much the different method of construction as it is the operation and care and attention given a battery that counts in the life it will have.

The ideal conditions are even temperature, reasonable charge and discharge limits over given periods of time, and these, coupled with ordinary good care, such as keeping the plates covered with distilled water, and an occasional overcharge to guard against sulphation (a disease common to lead-plate storage batteries) are the things which will mean more to the user than anything else.

The farmer has a right to demand and he does demand, that the same expert attention and knowledge should enter into the construction of utility devices intended for his use, as do in those produced for the industrial world. He accepts these things pretty much as a matter of fact. He knows but little about the different intricate problems entering into the combination of an internal-combustion engine, an electric generator and a storage battery, and when we go to him with our products let's tell him not so much of the detail perhaps, but let's assure him that those who designed this plant were experts, that the question of durability of the battery and every other part of our plant has had due consideration. Let's show him why he should expect a much more durable machine because we have so assembled, it that the battery will not be abused or sacrificed in order to cut down the running hours of the engine and generator to four or so hours while, as a matter of fact, from the standpoint of economy it should require seven or eight hours to charge it. In other words, charge the battery at a much lower rate, even though the time required is greater.

Let's get down to brass tacks on this question of battery and just quit "kidding" ourselves and others with the argument that one pasted-plate battery, consisting of the same elements with the same electrolyte and about the same weight, is so everlastingly much better than another. All good standard batteries are good enough, if given a chance, and they will give a service equivalent to their cost, if we will give them the proper treatment and will spend more time teaching the farmer how to use and care for his battery and less time knocking the other fellow's product.

The longest way around is the sucker's way home. Drive home in the shortest possible time the merits of the plant you are selling and let the other fellow do the same.

FIRE PROTECTION ASSOCIATION TO MEET IN CANADA.

The 23d annual convention of the National Fire Protection Association will be held in Ottawa, Canada, on May 6 to 8. The Dominion Government is undertaking important special activities in fire prevention that it is hoped will be stimulated by the association's meeting in the Canadian capital.

Opportunity for Electrical Manufacturers in Japan and China

Report of Bureau of Foreign and Domestic Commerce Contains Valuable Information on this Subject—Data Gathered by R. A. Lundquist, Trade Commissioner

THE Bureau of Foreign and Domestic Commerce has recently published a report of the opportunities for electrical goods in China, Japan and Vladivostok by R. A. Lundquist, Trade Commissioner. This report contains considerable information for American electrical manufacturers who are interested in this export trade. For this reason a brief resume of the report concerning conditions in Japan and China is reproduced herewith:

Electrical Conditions in Japan.

Mr. Lundquist states that Japan has shown a wonderful electrical growth in the last 10 or 15 years. Central-station systems have been established in great numbers and service has been extended to all parts of the country. Official figures indicate there were 658 such systems in July, 1917. The actual development is greater than the figures indicate, inasmuch as many of the stations are hydroelectric and supply a considerable number of cities and villages. Japan, therefore, has been a large consumer of electrical goods. A few years ago these were imported, but the strong home market that was opened up brought about a development in the manufacture of all kinds of electrical apparatus equipment, supplies, and accessories, and now the country is becoming a competitor in certain lines instead of a customer of the United States. An idea of the growth of electrical manufacturing in Japan is shown by data from the trade returns of that country from which it appears that in the item of insulated electrical wire alone there was imported into Japan in 1912 an amount in excess of $2,693,000. In electrical machinery the imports in 1911 amounted to nearly $3,000,000.

Up to September, 1917, there were 530 power and light systems in Japan, 42 electric tramways, and 48 combined railway and lighting systems. The figures also show there has been a strong development in public-service systems in that country in the last few years. In addition to the systems mentioned there were in 1915, 1609 private plants and 121 Government-owned plants, with 53 of the former and 6 of the latter under construction. It appears that in 1915 there were 3,051,925 families using electric lights, and there were 39,310 power consumers with 42,789 motors. and 13,680 more classified as isolated, or Government-owned plants, while in 1916 there were 76 municipal or private electric railways in operation.

Heretofore American manufacturers have sold the largest percentage of generators, switchboards, and switch gear. While switchboards and switch gear are turned out by Japanese works, they have not made the progress in these lines generally that they have in the apparatus lines. Americans should be able to sell higher-voltage equipment and considerable of the instrument and relay requirements for the boards that are made up locally.

The United States, Germany, and the United Kingdom have until the last few years furnished most of the requirements in motors and controlling devices, but since 1913 Japanese motors have been coming into the market more and more. While there are a few fair Japanese motors, it is not believed they will give continuous satisfaction as an average American motor will.

The import figures for ammeters and voltmeters show American goods leading strongly. Schools and central stations have bought high-class American testing instruments to a fair extent. In wattmeters the United States has had a good trade for some years. Although American alternating-current meters in normal times cost more than foreign makes, they are better and at present are meeting foreign prices closely. There is also some small opportunity for the sale of high-class American wiring supplies, such as flush push switches, receptacles, fancy shades semi-indirect lighting units, etc., for use in new modern buildings.

One class of goods that will probably find a market in Japan for a time are those that are used in connection with electric signs. The Japanese appear to be taking up electric signs to an increasing extent and appreciate the use of electricity for advertising purposes. It is believed that patented types of sign sockets, flashers, etc., will find an increasing sale. Fittings for outline lighting should have a small sale and some flood-lighting equipment is also used.

Japanese engineers follow American transmission and distribution practice quite closely. Line construction, switching stations, and substation arrangements are generally similar to those employed in the United States, except in a few instances. It is estimated there is about 20,000 miles of "extra high pressure" lines in operation.

A rather unique situation has developed in Japan with regard to telephone service. In this country if a person wants a telephone installed in his home or office he is incensed if, on telephoning to the company in the afternoon of one day it is not done by the morning of the day following. In Japan, if we are to believe a newspaper of Tokyo, it appears that in the fall of 1917 there were 153,000 subscribers awaiting installation of apparatus, "some of them having waited for more than 10 years." It also appears that when a subscriber is willing to give up his wire he offers it to a broker who has a long list of buyers and the number is sold through one of these buyers for anywhere from $250 to $750.

Field for American Electrical Goods in China.

The people of China have shown a progressive tendency and with its great population and increasing purchasing power, an increase of a very small percentage in purchases will make a large aggregate. As an instance, it is shown that 1% of the population aggregates three times the population of New Zealand alone. Not only do the numerous wealthy merchants and officials appreciate modern conveniences and com-

bling American types and many being made by a forts, but as one passes along the streets where electricity is available he is struck by the number of small shops that have electric lighting. Not only this, but they appear over rather than under-lighted, showing they are liberal consumers.

Those who wish to meet success in entering this market must bear in mind that first of all they must arrange for proper representation; that, secondly, they must have goods adapted to the needs of the Chinese under existing standards; and that they will find it a great advantage if their representatives in China are able to extend moderate terms of credit to native companies that may buy central station apparatus and materials. American goods have a good name and the United States as a nation stands well with the Chinese. If American electrical manufacturers are willing to cultivate the market in a broad-minded, thorough manner, China affords an export market almost as rich in its potentialities as all of South America.

While a fair volume of electrical trade is possible now, the great volume of trade with China will come with the greater development of the country; this will increase purchasing power, which will result in a more extended use of electrical service. Combined with earning power, education will also result better living and everything that goes to make up a higher standard of living.

Prior to the war the chief competitors in the field for transformers were one of the American companies, a German, and two of the large English companies. American transformers used in China have a very good reputation, only one complaint being made. This was in regard to small-size three-phase units, of which the general criticism was made that they were not so satisfactory as the best British transformers of the same type.

The gradual electrical development in China is bringing an immense market for motors. The business will not be in large units as a rule, but rather the reverse, since a great deal of the demand will be for low-horsepower motors for work that has hitherto been done by hand, horses, or by mules, such as small rice or bean-oil mills and machine shops. The development of railroads will bring a large market for motors, since electric drive will be employed in all new railway machine and repair shops, and mining on a large scale will also create a broad field for the sale of electrical power apparatus of all kinds. In addition there will be more cotton mills, silk filatures, cement mills, cold-storage plants, etc., which will mean increased demand for electric motors. From this development will come the market for larger-type motors, but the volume of business during the next few years will likely be in the smaller capacities, motors of 2 to 25 hp.

In the past England, Germany, and the United States, with Japan a growing factor, have supplied most of the motors used in China. In direct-current lines, American motors are generally high in price, the British and Germans competing with each other closely in normal times. In alternating-current motors the American manufacturers compete well, quality considered, and in single-phase lines they show not only better operating characteristics, but lower prices as well.

In Shanghai, American single-phase motors have not been strongly represented in the past apparently, but if properly pushed there are several makes that can undoubtedly do considerable business there. American single-phase motors are the best in the market, the only strong competition noted coming from England. The British competition can readily be met when American motors are locally represented, and well-known American designs are being sold to British central stations, owing to their marked superiority and better price. This is one of the few instances where higher-quality American apparatus sells at a lower price than its inferior foreign competitor.

At present China presents only a limited market for portable instruments, but in this line American manufacturers may do a little better, since quality is more of a factor in this type of instruments than in panel meters. One field for portable instruments, and switchboard types as well, that American manufacturers can cultivate is the market afforded by the development of the technical school in China. By furnishing instruments to these schools at a small margin of profit at the start not only is there an opportunity to secure such business in the future at better prices, but the student will become accustomed to good instruments and will not be satisfied to use inferior meters when he completes his course and takes a position with a power company.

The meter business is growing rapidly, as new plants are being installed. In 1918 they were imported in the amount of over $40,000, largely of the alternating-current types. Prior to the war one American manufacturer only seemed to beat all active, but since then two or three others have arranged for representation and have sold a fair number of meters. Foreign meters do not have the quality of American meters, not only are they less accurate over a period of time, but they seem to deteriorate more quickly under the climatic conditions.

American exports of batteries have been of fair volume, the amount being for China and Hongkong in 1918, $34,419. In the dry-cell line American manufacturers are in a better position and there is a good market, the majority of the telephone systems being of the magneto type. The climate is such that cells do not dry out as in some countries and the normal life is longer. There should be a further opportunity for American manufacturers to do a fair amount of battery business in connection with the sale of electric vehicles.

In exchange equipment and in telephone instruments since the war began, competition has dropped to practically nothing, and the United States and Japan are now furnishing practically the entire market. When normal conditions are re-established, it is believed that American telephone manufacturers will be able to compete readily for exchange equipment and subscribers' sets.

Before the war American, British, German and Dutch and to some extent, Japanese, wiring materials were on the market. British and German houses sold the bulk. In wire England and Germany sold the most, with the United States getting a little business. Now the United States, the Netherlands, and Japan have been supplying the market, with the Netherlands dropping off as shipping conditions became acute.

Screw sockets of both American and Japanese manufacture are being sold in China, the latter resem- Japanese manufacturing plant in which American capital is invested. These latter sockets, made in Japan are not so good as those made in the United States, however, according to users, and while Japan will be serious competitor in this line, it is believed that Amer-

ican manufacturers can compete in normal times, both in standard types and in a type similar to those developed by Germany.

Semi-indirect lighting is rapidly gaining favor among both foreigners and Chinese. Most of this class of fixtures is either purchased complete from the United States, or the bowls and chains are imported from the United States and the fittings are made up locally by the importer.

Only one item in general domestic and office appliances is selling to any extent in China; that is the electric fan, which is universally used on account of the hot, humid summer weather and which is one of the most important of American electrical exports to that country. In 1918 those exported amounted to $173,520, the American trade having trebled when the war removed European competition. At present several good American fans are on the market.

It appears that it is possible that certain types of small American signs for use in windows can be sold in China. The Chinese appreciate sign advertising and seem willing to use electricity in connection with it.

While there will be a small but increasing demand in China for the best in all lines of electrical goods, coming from the wealthy Chinese as well as from foreigners living in the country, importers state China, generally speaking, wants apparatus and similar large equipment to be the best, but that in minor devices, supplies, and accessories the cheapest will be favored.

It is impossible in a review of this kind to give a comprehensive analysis of the Chinese market for electrical goods and those interested are therefore directed to Mr. Lundquist's report. It may be said in passing, however, that a complete analysis is given of central-station development factors, practice and management of generators, switchboards and switch gear; transmission and distribution equipment; underground cable; bare and weatherproof wire; poles and towers; crossarms, insulators, and line hardware; transformers; street lighting fixtures; motors and controlling apparatus; electric-railway equipment; meters and testing instruments; lamps; batteries; electric vehicles; farm-lighting plants; telephone and telegraph equipment; wiring supplies and lighting fixtures; fans and other domestic and office appliances and other electrical equipment.

This report is designated as Special Agents Series No. 172, and is entitled: "Electrical Goods in China, Japan and Vladivostok." It can be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 30 cents a copy.

MARKET FOR ELECTRICAL MACHINERY AND APPLIANCES IN AUSTRALIA.

The installation of electrical devices and the use of electricity as a power-saving factor is in its infancy in the Australian Commonwealth, says the current issue of *Guaranty News*. This state of affairs has probably been brought about more by a lack of possible hydro-electric development schemes than by an ignorance of the economic and labor-saving properties of electricity. The development of industry in the United States, due to electrical conservation, is being constantly brought before the Australian public in the daily newspapers, magazines, and parliamentary sessions, with the result that motor generating plants are fast springing up throughout the country, the electrification of all suburban railroads is being contemplated for the near future, while the lighting of suburban areas and country towns is gradually being accomplished by municipal power stations. This field, therefore, presents a large problem for the electrical exporter. Appended are self-explanatory figures taken from Commerce & Navigation of the United States for 1917, showing the importation of electrical apparatus, etc., from the United States during the last four years prior to 1918:

	1914.	1915.	1916.	1917.
Lamps, incandescent metal filament	$12,802	$24,913	$91,708	$82,915
Carbon filament and arc	Negligible, under $10,000			
Meters and other measuring instruments		$22,987	$61,965	$68,460
Telephones	$277,477	404,975	61,975	55,958
Transformers	46,641	53,742	70,192	44,124
Interior wiring supplies	17,726	5,022	28,992	34,832
Insulated wire and cables	121,181	64,304	66,360	72,860
Fans	10,494	12,338	21,336	15,873
Dynamos and generators	91,880	75,973	24,336	88,016
Batteries	35,113	42,264	86,345	114,635
Motors	268,359	634,362	685,596	720,058
All other electric machinery	515,647	622,672	549,882	821,151

INSULL EXTENDS ACTIVITIES TO WISCONSIN.

A new holding company has been created by Samuel Insull. This will be called the Northwest Utilities Co., and will begin business owning or controlling the Wisconsin River Power Co., the Southern Wisconsin Power Co., and the Wisconsin Power, Light & Heat Co. The company was incorporated in Delaware, with capitalization of $5,000,000 common, $5,000,000 preferred, and $1,000,000 collateral notes. But $1,200,000 preferred and $2,000,000 are outstanding. The notes are secured by the deposit of the stock and of $750,000 Middle West Securities preferred. They are now being offered. Samuel Insull is president of the company.

CONSOLIDATION OF SPOKANE TRACTION LINES UNDER CONSIDERATION.

At Spokane, Wash., plans favorable to a consolidation of the electric railway lines of the two traction companies apparently are being worked out. The interests referred to are those of the Washington Water Power Co. and the Spokane & Inland Empire Co., which operate competitive lines in Spokane and tributary country. The plan under consideration provides for the merging of the two properties under a new name, the two existing companies to take stock in the new concern. The great necessity in the situation is to produce greater revenue, and it is conceded that the operation of the two properties under a unified system would contribute to economy and better service.

A factor in the situation is that the state law limits passenger fares to five cents within municipalities, and an effort is being made to induce the Legislature to repeal that limitation. If such repeal is put through the Spokane consolidation will no doubt be hastened. If the limitation is not removed, the result will be to strengthen the tendency toward municipal ownership, already accomplished in Seattle, and under consideration in Tacoma.

The interurban service is an important factor in the Spokane territory. One electric traction line extends from Spokane to Colfax, a distance of about 150 miles; another line runs from Spokane to Coeur d'Alene, Idaho, a distance of 30 miles; and other lines extend to nearer points.

CENTRAL STATIONS OF FOUR MORE STATES SHOW PROGRESS.

Reports from Kentucky, Florida, Tennessee and Nebraska Given Out by Census Bureau.

The latest preliminary figures of the forthcoming quinquennial report on central stations show that the companies in Kentucky, Florida, Tennessee and Nebraska shared in the general prosperity and growth which was evident in the other states which have been given out. The states which have previously reported are: Nevada, Vermont, Mississippi, New Mexico, Utah, Rhode Island, Wyoming, Connecticut, Arizona, Colorado, Virginia, New Hampshire, Delaware, Maryland, District of Columbia, Oregon and New Jersey. The statistics for these states have been published in previous issues of the ELECTRICAL REVIEW.

The statistics relate to the years ending Dec. 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; those operated by the Federal Government and state institutions; and those that were idle or in course of construction. They were given out by Director Sam. L. Rogers, of the Bureau of the Census, Department of Commerce, and were prepared under the supervision of Eugene F. Hartley, chief statistician for manufacturers.

The figures for Tennessee show that the actual increases, although large from 1907 to 1912, were much greater for the later five-year period; so also were the proportionate increases in most particulars. Thirty-one new plants have been added since 1912, but a number of those that reported separately in 1912 were merged into combinations before 1917. The total horsepower was 201,912 in 1917, compared with 68,994 in 1912, or an increase of 192.7%. In 1917, water power formed 65.2% of the total, compared with 40.2% in 1912, having increased from 1240 hp. in 1907 to 27,750 in 1912 and to 131,652 in 1917.

CENTRAL STATION STATISTICS FOR TENNESSEE.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	106	90	78	35.9	17.8
Commercial	70	60	50	40.0	16.7
Municipal	36	30	28	28.6	20.0
Income[2]	$4,937,285	$2,448,218	$1,299,983	279.8	101.7
Electric service	$4,877,359	$2,408,762	$1,266,610	285.1	102.5
All other	$ 59,926	$ 39,456	$ 33,373	79.6	51.9
Total expenses, including salaries and wages	$4,436,698	$1,753,875	$ 882,763	402.6	153.0
Number of persons employed	1,008	656	416	142.3	53.7
Salaries and wages.	$ 777,922	$ 455,212	$ 247,764	214.0	70.9
Total hp.	201,912	68,994	28,730	602.8	192.7
Steam engines:					
Number	129	130	128	0.8	—0.8
Hp.	69,679	40,799	27,490	153.5	70.8
Internal-combustion engines:					
Number	18	4	.....	.....	350.0
Hp	581	445	.....	.....	30.6
Water wheels:					
Number	57	32	14	307.1	78.1
Hp.	131,652	27,750	1,240	10517.1	374.4
Kilowatt capacity of dynamos	145,335	49,640	20,911	595.0	192.8
Output of stations, kw-hr.	564,914,272	75,544,893	34,847,956	1521.1	647.8
Stationary motors served:					
Number	3,516	1,720	1,193	194.7	104.4
Hp	43,213	20,357	4,524	855.2	112.3
Number of street lamps:					
Arc	2,861	3,928	[3].....	.....	—27.3
Incandescent, etc.	15,099	6,732	[3].....	.....	124.3

[1]A minus sign (—) denotes decrease. [2]Exclusive of $2,073,731 in 1917 and $1,372,745 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

The output of stations in 1917 was 564,914,272 kw.-hr. and in 1912, 75,544,893 kw.-hr. an increase of 647.8%, compared with a gain of 116.8% from 1907 to 1912.

The figures presented for Kentucky show increases in practically all items from census to census. The increase of 36 in the total number of establishments shown for the later five-year period is not truly representative, since 23 establishments that reported separately in 1912 were included in combined reports in 1917, while 60 new plants have been added since 1912.

CENTRAL-STATION STATISTICS FOR KENTUCKY.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	125	89	83	50.6	40.4
Commercial	103	73	69	49.3	41.1
Municipal	22	16	14	57.1	37.5
Income[2]	$4,436,445	$2,754,115	$1,660,700	167.1	61.1
Electric service	$4,334,938	$2,683,137	$1,610,475	169.2	61.6
All other	$ 101,507	$ 70,978	$ 50,225	102.1	43.0
Total expenses, including salaries and wages	$3,531,547	$2,244,906	$1,283,918	175.1	57.3
Number of persons employed	1,031	907	585	76.2	13.7
Salaries and wages.	$ 759,383	$ 635,829	$ 301,794	151.6	19.4
Total hp.	98,752	81,767	41,984	135.2	20.8
Steam engines:					
Number	165	171	157	5.1	—3.5
Hp.	96,066	81,191	41,969	128.9	18.3
Internal-combustion engines:					
Number	63	6	1	6200.0	950.0
Hp.	2,301	576	15	15240.0	299.5
Water wheels:					
Number	7	.....	.....	.....	.....
Hp.	385	.....	.....	.....	.....
Kilowatt capacity of dynamos	69,442	54,062	29,140	138.3	28.4
Output of stations, kw-hr.	122,630,433	75,593,179	37,232,623	229.4	62.2
Stationary motors served:					
Number	9,192	4,106	1,124	717.8	123.9
Hp.	63,784	22,621	9,962	540.3	182.0
Number of street lamps:					
Arc	6,757	7,332	[3].....	.....	—7.8
Incandescent, etc.	10,899	5,278	[3].....	.....	106.3

[1]A minus sign (—) denotes decrease. [2]Exclusive of $153,411 in 1917 and $103,324 in 1912, reported by electric railway companies as income from sale of electric current. [3]Not available.

There was a remarkable increase of 40 in the number of new establishments in Florida since 1912, 28 commercial and 12 municipal, although, by reason of the combinations in single reports of a number of plants that reported separately in 1912, there was a

CENTRAL-STATION STATISTICS FOR FLORIDA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	82	50	37	121.6	64.0
Commercial	50	33	24	108.3	51.5
Municipal	32	17	13	146.2	88.2
Income[2]	$2,376,908	$1,361,201	$654,251	263.3	74.6
Electric service	$2,334,876	$1,338,781	$630,632	270.2	74.4
All other	$42,032	$22,420	$23,619	78.0	87.5
Total expenses, including salaries and wages	$1,681,569	$1,052,696	$480,726	250.4	60.6
Number of persons employed	678	455	265	155.8	49.0
Salaries and wages.	$471,035	$286,053	$156,700	200.6	64.7
Total hp.	58,195	33,836	14,370	305.0	72.0
Steam engines:					
Number	140	90	74	89.2	55.6
Hp.	50,477	27,666	14,330	252.2	82.6
Internal-combustion engines:					
Number	24	6	1	2300.0	300.6
Hp.	2,008	500	40	4920.0	301.6
Water wheels:					
Number	5	3	.....	.....	66.7
Hp.	5,710	5,700	.....	.....	0.2
Kw. capacity of dynamos	37,812	23,619	7,804	384.5	60.1
Output of stations, kw-hr.	50,887,992	25,895,751	11,765,994	332.5	96.5
Stationary motors served:					
Number	2,097	1,121	189	1009.5	87.1
Hp.	22,235	14,141	1,584	1303.7	57.2
Number of street lamps:					
Arc	1,249	1,213	[3].....	.....	3.0
Incandescent, etc.	12,621	4,752	[3].....	.....	165.6

[1]A minus sign (—) denotes decrease. [2]Exclusive of $749,113 in 1917 and $561,416 in 1912, reported by street and electric railway companies as income from sale of electrical current. [3]Not available.

net gain of only 32 in number of stations from 1912 to 1917.

The actual increases shown for Nebraska from 1912 to 1917 are in excess of the large increases for the prior five-year period. The remarkable addition of 76 plants from 1907 to 1912 was exceeded in the later period, when 154 new stations were added, 85 commercial and 69 municipal. The actual gain, however, was only 123, because of combinations in single reports of a number of plants reported separately in 1912.

CENTRAL-STATION STATISTICS FOR NEBRASKA.

	1917.	1912.	1907.	Per cent of increase,[1] 1907 to 1917.	1912 to 1917.
Number of establishments	297	174	98	203.1	70.7
Commercial	148	112	73	102.7	32.1
Municipal	149	62	25	496.0	140.3
Income[2]	$4,860,874	$2,802,614	$1,562,669	211.1	73.4
Electric service	$4,640,262	$2,678,240	$1,474,426	214.7	73.3
All other	$220,612	$124,374	$88,243	150.0	77.4
Total expenses, including salaries and wages	$3,911,923	$2,239,542	$1,158,060	237.8	74.7
Number of persons employed	1,227	882	404	203.7	39.1
Salaries and wages	$979,345	$598,703	$313,427	212.5	63.6
Total hp.	112,103	52,168	30,020	273.4	114.9
Steam engines:					
Number	187	156	135	38.5	19.9
Hp.	89,119	42,452	26,221	239.9	109.9
Internal-combustion engines:					
Number	281	91	17	1552.9	208.8
Hp.	12,480	3,832	845	1376.9	225.7
Water wheels:					
Number	57	44	19	200.0	29.5
Hp.	10,504	5,884	2,954	255.6	78.5
Kw. capacity of dynamos	78,227	34,586	20,041	290.3	126.2
Output of stations, kw-hr.	129,531,131	56,299,682	31,958,739	305.3	130.1
Stationary motors served:					
Number	7,842	3,575	1,719	356.2	119.4
Hp.	57,435	26,325	10,776	433.0	118.2
Number of street lamps:					
Arc	178	2,451	[3]	.....	—92.7
Incandescent, etc.	27,752	12,149	[3]	.....	128.4

[1] A minus sign (—) denotes decrease. [2] Exclusive of $469,481 in 1917 and $130,958 in 1912, reported by street and electric railway companies as income from the sale of electric current. [3] Not available.

PROPOSED NEW DEVELOPMENTS IN BRITISH ELECTRICAL MANUFACTURING.

Expert Review and Recommendations in Committee's Report to Ministry of Reconstruction.

We referred some weeks ago to the Engineering Trades (New Industries) Committee of the British Ministry of Reconstruction, its constitution, purposes and work. An exhaustive report covering the whole of its investigations extending from December, 1917, to December, 1918, was published recently that may prove of interest to American electrical manufacturers. Fifteen separate branch committees devoted themselves each to a particular group of articles suitable for manufacture, by those with engineering trade experience or plant, which were either not made in the United Kingdom before the war or were made in insufficient quantities and for which there might be a considerable after-war demand. In conference with members of the various industries, a lengthy list of articles was prepared, and in some cases experiments were undertaken by some of the branch committees before reporting on the possibility of manufacture.

The main committee strongly recommends the more extensive adoption of specialization and standardization, particularly in the case of small manufacturers who they consider would do better to confine themselves to the manufacture of a few types of articles which they could then bring to greater perfection and produce more cheaply. The committee emphasizes the importance of co-ordinating manufacture and design, recommending that in future all Government designs and specifications should be considered in co-operation with experts in workshop methods of production. In order to stimulate production the committee considers that both employers and workpeople should be educated both generally and specially; employers and staff, in regard to what is being done in an up-to-date works where guaranty production under scientific management is carried on, and workpeople, to remove the impression that quantity production produces unemployment, and to make them realize the national importance of producing the maximum output in the minimum time. The committee recommends that new industry should not be introduced into the United Kingdom unless the wages paid to those employed in it are such as to insure an adequate standard of living and unless arrangements can be made for regulating rates of wages and hours of labor.

The Branch Committee on Electrical Apparatus and Machinery considered a very full list of electrical articles, but it found that in regard to most of them ample manufacturing facilities were now in existence and in many cases did exist before the war for meeting the whole requirements of the United Kingdom and of the British colonies and in certain cases for meeting the export trade to other countries, but that these facilities were not fully employed owing to the importation of articles from abroad. Special stress is laid on the necessity for ensuring the continuance of the manufacture of carbons and that German magnetos should be excluded from the country for a period after the war, except under license, and that a duty should be imposed on all imported magnetos.

Manufacturers intimated to the committee during the course of the inquiry their intention to undertake the manufacture of the following: Automobile lighting and starting sets; electric truck and vehicle motors; electric fans (table, ceiling and ventilating); small motors of one-half hp. or less; small portable electric drills; small portable electric grinders, buffers and polishers. The labor employed in the production of these articles will be chiefly women supervised by skilled men. In regard to insulating materials considerable progress has been achieved during the war in overcoming the deficiency but the collective opinion of the industry indicates that an enormous amount of research work is necessary, and that the manufacture in England cannot be successfully established without state assistance and support. Many firms are preparing for increased production of insulating materials, and the fostering of this section of industry is recommended. Concerning porcelain for electrical requirements, co-operation has been established between porcelain manufacturers and electrical manufacturers with the object of promoting standardization of parts, research, etc.

Among the other industries upon which the electrical is dependent for certain requirements are: Refined oil for transformers and switchgear; silicon steel for generators, motors and transformers; glassware, such as lamp shades and lamp bulbs; flexible metallic tubing for industrial electrical appliances. The war disclosed a shortage of these materials and the British trade associations affected are urged to consider the establishment of the necessary productive capacity.

The main conclusion of the Electrical Branch Committee is that the war experience and the findings

of various industrial committees have proved that the electrical industry is a "key" industry and must be protected by the state against "dumped and sweated goods."

The importance of the manufacture of scientific apparatus is dealt with by another branch committee which shows that no country can remain long in the front rank industrially if it depends upon others for its essential scientific apparatus, because such apparatus is generally produced where science is most actively applied to industry. The manufacture of certain articles in this class, turned out in other countries in large quantities and cheaply, constitutes the chief training ground for skilled mechanics accustomed to work of the highest precision and finish.

TESTIMONIAL TO BRITISH ELECTRIC POWER IN THE WAR.

British municipal and company-owned electric supply undertakings have received from Winston Churchill, on relinquishing his position as Minister of Munitions, a testimonial, as head of the department, to the part taken by all who had been responsible for electric supply throughout the war. The terms of the tribute were:

"The over-riding needs of the British armies have required the output of war material on an unprecedented scale, and in every class of supply the demand has been met. But this achievement would have been impossible without the effective and ungrudging co-operation of the principal electrical undertakings of the country. The demands made upon you have been exacting, and I recognize to the full the increasing difficulties that you have been called upon to surmount in maintaining and augmenting the supply of electric power on which the great industrial centers have depended. I therefore desire to convey to you and to all members of your staff my sincere thanks for the valuable services you have rendered to the Ministry of Munitions."

DISCOVERY OF SUBSTITUTE FOR PLATINUM AS A CATALYST.

Announcement is made of the discovery of a new substance to take the place of platinum in the manufacture of sulphuric acid, releasing large quantities of sorely needed platinum for other uses.

The discovery was made during the latter days of the war. Sulphuric acid is required in the manufacture of high explosives, and a serious stringency was being faced due to the scarcity of platinum and the difficulty of obtaining it, even in small quantities, from Russia.

In the manufacture of sulphuric acid, sulphur dioxide (SO_2) is first obtained by burning sulphur pyrites. This sulphur dioxide gas, after being dried, is passed over magnesia containing a small percentage of platinum. In this process the sulphur dioxide takes up an additional atom of oxygen (O), thus forming sulphur trioxide (SO_3). This sulphur trioxide, in turn, is passed through water (H_2O), forming sulphuric acid (H_2SO_4).

In the above operation the platinum performs the function of a catalyst, in that it quickens the process of converting the sulphur dioxide into sulphur trioxide.

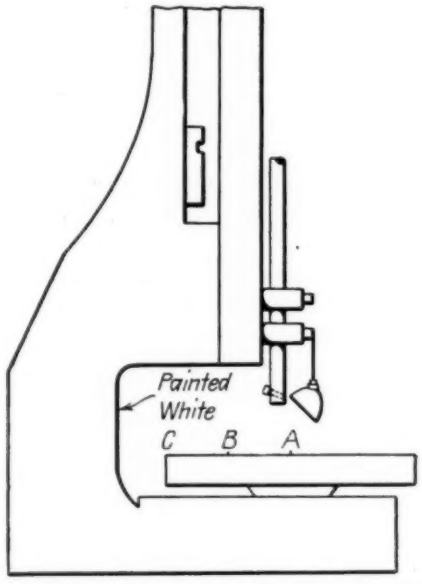
The suggestion which resulted in the discovery of the substitute was made by Charles H. McDowell, director of the Chemicals Division of the War Industries Board and president of the Armour Fertilizer Works. It was developed by H. H. Meyers, a fellow of the Mellon Institute of Industrial Research.

Not only has the new catalyst been demonstrated as practical in laboratory tests, but a commercial plant has been established which is producing the substance in quantity. Not only is it cheaper than platinum, but has been found to be less sensitive to "poisoning." Altogether the discovery is regarded as a distinct advance in the art.

The same catalyst has been tried out successfully in a modified Deacon process for making chlorine gas in connection with the manufacture of "mustard gas." By its use it has been found possible to effect a considerable saving in the electrical horsepower required by the process. Ordinarily, for the manufacture of 100 tons of chlorine 20,000 hp. would be required. With the use of the new catalyst the same quantity can be made from 2000 hp.

IMPROVING ILLUMINATION BY WHITE SURFACES.

A good overhead system of lighting usually provides all the light required for most interiors. Frequently, however, local lighting is employed in addition to the overhead lighting at places in the shop. To assist local lighting the use of white paint has proved very effective. In one case a large shop containing massive vertical slotters was lighted with an overhead system to an average intensity of about 2 ft.-candles. The heavy machines were painted dark, so that the lighting of the tables in the region where the cutter



Method of Improving Illumination by White Surface.

works was sufficient for setting the tool accurately to the pencil marks on the castings to be machined. As a remedy a lamp on a drop cord was provided for each machine, and the surfaces of the machine facing the table were painted white. This avoids any shadows from the local lamp, as the reflection from the white surfaces softens the shadows very materially and increases the illumination on the table by about 75%. Thus the meter readings taken at the base plate shown in our illustrations gave an improvement of 100% with the use of white paint in the lighting at the points A and C, and over 50% at the point B.

Editorial Comment

A Combined Electrical Fire and Safety Code

THE National Electrical Safety Code has been in course of preparation by the Bureau of Standards for several years. Over two years ago a tentative draft was published for examination, trial and constructive criticism. A revised edition is now in course of preparation and there is every indication that when it is completed the safety rules will be made mandatory by many municipalities and state commissions. Indeed, some have already taken this step.

As soon as it became evident that a set of safety rules would be available and would be put into application the question arose, especially among many municipal electrical inspectors, as to whether, instead of using a separate set of safety rules in addition to the rules of the National Electrical Code, which is published by the fire underwriters and now widely applied, it would be feasible to combine all of the rules into a single code. This would have the obvious advantages of simplicity and convenience and would provide greater assurance that there would be no actual conflict between the requirements of the individual rules.

Nearly a year ago the Bureau of Standards, in deference to this demand, undertook the experiment of combining the two sets of rules into a single code in order to ascertain whether the project were feasible and whether the result of such a combination would be satisfactory and suitable for general use. It is obvious that such a code cannot take the place of the two individual codes since certain parts of the industry and certain inspectors, especially the underwriters' inspectors, are concerned only with one set of rules. For the municipal inspector, however, and for many others who are concerned with both accident prevention and fire prevention, such a combined code would be widely welcomed, if it is framed in such a way as to meet practical requirements.

The combined code prepared by the Bureau of Standards has not yet been made generally available and we are consequently not in a position to dwell upon its merits and demerits. It is evident, however, that if the work of combination is well done so that the code is considered suitable for adoption by municipalities or other administrative authorities there will be a great demand for it, not only by electrical inspectors, but also by contractors, manufacturers and others concerned with the application of the rules. Indeed, such a development seems almost inevitable and the only question in regard to the particular code now under discussion will be as to the success with which the idea has been carried out.

This subject came up for discussion at the recent convention of the Western Association of Electrical Inspectors, as reported in our issue of Feb. 1. Some of the questions which were raised in connection with that discussion should be answered without much difficulty. As we understand the proposition, the National Electrical Code and the National Electrical Safety Code as already existing will not be in any way influenced by the proposed combination. The Electrical Committee of the National Fire Protection Association is responsible for the one and it will no doubt continue to revise it biennially, as heretofore. No doubt the National Board of Fire Underwriters will continue its separate publication. The Bureau of Standards, which is responsible for the Electrical Safety Code, will continue its separate publication, as was stated by Dr. Lloyd, the representative of that Bureau. We understand that this Code will also be periodically revised by the institution which has created it and stands sponsor for it. The Combined Code would then be revised to correspond with the latest revision of the two separate codes from which it is made up, so that its contents would be determined by the same agencies responsible for the separate fire-prevention and accident-prevention rules.

No new requirements are involved in this Code and no new bodies would take any responsibility in connection with its contents and with the requirements which its application would entail. Its completion and publication appear to be purely matters of convenience and that convenience is dependent upon the manner in which it is done. Such a project should be carried out only with the fullest consultation and co-operation of those who have heretofore been connected with inspection work and the preparation of rules which cover it. Only by such co-operation of those most intimately concerned can good results be looked for.

Home Rule for Public Utilities

FROM the time of the foundation of our nation when by the American Revolution the former colonies threw off foreign rule and set up the first enduring democracy, home rule has had a firm standing in American politics. It stood, and always should stand, for high ideals in government—self-government based on justice and equal opportuntiy for all. These ideals have been followed quite closely by our national government and by most of our state governments, also at times by our municipal and other local governments, but our cities have for scores of years borne the odious reputation of being grossly misgoverned and of being a sad blemish on our entire system of self-government. Therefore, when there is

National Electric Light Association Con

RAPIDITY of progress, which has characterized the central-station industry of this country, is due in no small degree to the activities and influence of the National Electric Light Association. In its nearly 44 years of strenuous existence this organization has taken the leadership in promoting interchange of experiences and new ideas among the producers of electricity for light, power and heat, and in educating them to utilize the latest developments of the scientist, the engineer and the modern business specialist. This broad educational work has been done very largely through personal contact at the association's conventions, which first were semi-annual and in later years annual gatherings. With the rapid growth of the membership, the influence of the organization has been decidedly broadened through its publications, especially its proceedings and bulletins, but its annual meeting has remained like a Mecca to draw the pilgrims from all parts of the land to the sources of new inspiration and knowledge. Thus the N. E. L. A. convention came rightly to be looked forward to each year as the most influential gathering in the electrical industry.

During the war all the ordinary peace-time activities of every industry had to be readjusted to the urgent needs of the nation. Self-interest had to give way to service for the country. Quick to show its eagerness to help the common cause, the N. E. L. A. abandoned carefully developed plans for a large general convention in 1917 and held instead a short war service meeting at which were crystallized some of the first plans for the effective part that the central-station industry played in helping to win the war. The offer of the association to place the industry on a war basis was well expressed in this splendid statement: "With a realizing sense of the stupendous sacrifices involved, but with an abiding faith in the ultimate result, we pledge all that we have and all that we are to the holy cause." This pledge was fully carried out.

Last year the annual meeting again was a short and strenuous war convention attended principally by executives of the companies who formulated plans for still more effective co-ordination of efforts and resources for hastening prosecution of the war. These efforts were highly successful and appreciated by the national authorities. Naturally their execution at a time when the central stations had already lost so many men through the call for active military service prevented carrying on most of the ordinary N. E. L. A. activities, and committee work especially suffered.

But the war was won by our valiant men in khaki and blue and by the backing they received from the industries at home, among which the central-station industry took a leading part. We are now endeavoring to readjust these industries to normal peace condition, but a feeling of hesitancy and indecision is holding back many of them.

At this critical time, when a spirit of optimism is so much needed, it is a great pleasure to note that the N. E. L. A. has again stepped to the front and will lead the electrical industry in constructive measures to inspire confidence and stimulate speedy return

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raised the cry of "Home Rule" in a municipal campaign in the effort to have restored a former privilege of the city government that had to be withdrawn because of rank abuse and inequity, it is well to look upon the question with special care.

The vicious practices connected with franchise grants and renewals for public utilities in former years led some dozen years ago to inaugurating a complete change in the policy of public utility regulation. The privileges of city councils in utility rate revision and franchise renewals came to be restricted in many states and were turned over to state commissions specially created and equipped to handle these and related questions. In the intervening years this policy of state regulation of public utilities has become well established; it has, with almost no exceptions, been found vastly superior to all concerned, the public as well as the utilities, and it has gradually been extended throughout the coutry.

When a movement has become so widespread and so firmly established it is not to be supposed that there were not legitimate grounds for its origin and growth, nor is it to be expected that it can be readily upset and replaced by the former practice, however the latter may be claimed to be purged and purified. Therefore, the recurrent cries of "Home Rule" in the heat of municipal political campaigns may well be put down as pure buncombe intended, like so many campaign arguments and promises, to catch the votes of unsuspecting and gullible citizens.

It is surprising, however, how frequently the restoration of home rule for public utilities has been used as a campaign cry. The present mayoral campaign in Chicago is an example. Every one of the candidates has asserted he was not only in favor of it, but would try to have it restored. What is the sense of misleading the public by such cheap political trickery? The very fact that it is resorted to because the Public Utility Commission of the state revised certain franchise rates upward to correspond with greatly increased operating costs, which revisions have been upheld by the courts, shows that these would-be public officials could not be entrusted to handle the matter equitably.

vention Will Revive Former Activities

to normal activity. Announcement has been made that the association will hold its annual convention in Atlantic City during the week of May 19, and that plans are being perfected for making it all that the big pre-war meetings ever were. It is expected to make this the Reconstruction Convention and discuss especially those urgent problems that need to be considered promptly so as to restore the industry again to its former standard of "readiness to serve." There are many of these problems, among which may be mentioned increase in capacity of systems, revival of liberal policies as to line extensions, readjustment of war rates, employment of returning soldiers, resumption of former efforts in new-business development. These and other topics will no doubt receive attention.

It is also expected to hold the customary exhibition at the coming convention. The exhibits by manufacturers at N. E. L. A. conventions have always been of the greatest importance, since they have comprised in most cases the first displays of new apparatus and appliances and of improvements in standard products, all brought together where they can be brought before the eyes of big purchasers of the industry. Although the war greatly interfered with new development work, it must be remembered that there has been considerable work done in the three years since the last N. E. L. A. exhibition in 1916. This feature of the convention alone should, therefore, prove extremely valuable and merit making a long trip to view it.

Holding of another N. E. L. A. convention on a pre-war scale means not only the resumption by the association of active committee work, preparation of reports, papers, etc., but it signifies that the association feels that the central stations must hasten the readjustment from war to peace as soon as possible. On the part of many companies there has been manifested a sort of "watchful waiting" policy, marking time while conservatively letting others take the initiative. This was necessary during the war on account of the abnormal conditions. It is now time to give place to a much more optimistic policy of development, however. The association can well afford to take the lead in hastening this movement.

The ELECTRICAL REVIEW has just completed a survey of the present policies of the leading central stations as to resumption of construction and development work. A considerable number are maintaining a very conservative attitude, but it is very gratifying that the great majority are ready to do their utmost to make plant betterments and enlargements, line extensions, and other improvements to increase the capacity and reliability of systems, and to again take up the development of active new-business building which marked the central-station industry as one of the most progressive industries of the country. A somewhat detailed summary of this survey will be given in our next issue. It is especially pleasing to note that the decision of the N. E. L. A. to resume its customary activities is exactly in line with what the leading central stations are planning to undertake in the immediate future.

Private Initiative Must Not Shirk Resumption of Building

FINDING work for returning soldiers and sailors is one of the big problems of the time, which is aggravated by the necessity for also finding employment for the thousands of workers that came to the help of the nation by serving in munition plants and other industries that were so necessary to back up the work of our men at the front. The newspapers point out that there are thousands of unemployed men now walking the streets of our cities and it has been urged in almost every state of the Union that national, state and municipal public projects should be undertaken without further delay so as to put these men to work. The responsibility of the public authorities in meeting the emergency cannot be questioned, but this responsibility is not exclusively one that devolves upon the authorities alone. It is one that must be assumed by the entire public, including the business interests.

A very sane presentation of the larger aspect of this problem has been made by the Hon. Ernest Lister, Governor of the State of Washington, who in a recent message to the State Legislature submitted the following very logical summary of the responsibilities of private interests:

"All of the responsibility for furnishing employment should not be shoved over upon the governmental agencies, however. It is true that the nation, state, counties, municipalities and other political subdivisions can assist greatly in handling the problem. But it is equally true that the investor who had contemplated the erection of a business building, the individual who has desired to erect a new residence, the manufacturer who intended improvements in his factory, all of whose plans were delayed by war conditions, ought now quickly to so arrange their affairs that they may proceed with these contemplated improvements and thus aid in providing employment for those who desire and need it. I sincerely hope our people will not overlook this individual responsibility. They should not expect the entire problem to be worked out through public improvements that may be undertaken, for if this be the case the time will come when public work will cease and the labor problem will remain unsolved.

Week's Events

Central-Station Policies Discussed—Illuminating Engineers Consider War-Time and Shipyard Lighting — Meetings

NATIONAL ELECTRIC LIGHT ASSOCIATION CONVENTION TO BE BIG AFFAIR.

Annual Convention Will Be Held in Atlantic City May 19-23, With Exhibition and Other Usual Features.

The National Electric Light Association has decided to hold its annual convention in Atlantic City, N. J., on May 19 to 23, devoting it especially to reconstruction problems. Plans are being made to conduct the gathering of the large scale which was customary before the war.

The exhibition committee of the N. E. L. A. held a meeting at the headquarters on Feb. 15, under the chairmanship of J. W. Perry. It was formally decided to approve the proposition to hold the next annual convention at Atlantic City, the week of May 19, and to resume all the proposed plans and activities that had been so carefully worked out in 1917, with additional features of interest to the operating member companies. These will be given in full for publication as soon as possible. In the meantime the committee is communicating with all the pledged and prospective exhibitors, upon whom it is impressing the fact that this is the Reconstruction Convention after the Great War, the most notable and historic in the life of the N. E. L. A. H. G. McConnaughy, who is secretary of the exhibtion committee, should be addressed on all such matters at the association offices. It is suggested that all exhibitors get in touch with him at once.

INTERIM REPORT OF PUBLIC POLICY COMMITTEE, N. E. L. A., PRESENTED.

Discussion of Important Central-Station Policies of the Times Submitted by Leaders of the Industry.

At the annual convention of the National Electric Light Association held in Atlantic City in June last the Association placed itself on record unequivocally as pledging "all that we have and all that we are" to the winning of the war, and through such success, "the winning of a great peace." The members of the Association may take just pride in the active and unqualified support which has been given to our Government by the industry in the form of money, men and utility service, which have contributed in some measure to the glorious results that have been achieved.

The members of the Association will now be as willing to take hold of reconstruction problems and co-operate heartily and effectively in their solution as they were eager to support the war program; and it is not too soon to formulate policies to meet the conditions of the near future.

The following questions affecting the Association are especially considered by the Public Policy Committee in its report:

"For two years past the annual convention of the Association has been greatly restricted in attendance and scope, the questions considered being confined strictly to war problems. Your committee recommends that the 1919 convention of the Association be planned along pre-war lines as nearly as practicable under present conditions.

"The judgment and recommendation of your committee is expressed in the following resolution:

"RESOLVED, That we commend the action of the large number of corporations which gave to their employes who entered the military service in the present war the definite promise that they would be restored to their former employment at the conclusion of that service, and we strongly recommend to all our member companies that as far as practicable, they adopt the same practice.

"Employees who gave up their positions to serve in the Army or Navy or other governmental war service deserve well of their country, and it is but a just recognition of their patriotism to insure them against the loss of the means of livelihood which they could have continued to enjoy except for their disinterested and patriotic action in entering the military service of the country in its time of need.

"Public opinion will be divided as to the influence of war experience upon the question of public ownership of utilities. The former advocates of public ownership will try to see in the extension of public control exercised during the war a trend which is likely to continue. On the other hand, the general public will be likely to judge the merits of the question by its opinions as to economic and service results achieved under direct government control in comparison with the results of previous operations under corporate management.

"Government control of the railroad systems of the country during the war has been universally recognized as a wise procedure, because of the necessity of subordinating the individual interests of the various railroads to the all-important idea of securing the maximum of transportation service throughout the country for the movement of troops and essential commodities. The serious curtailment of the usual passenger and freight service coincident with the greatly increased charges for both classes of service, has been accepted by the public as necessary to the quickest possible success of the war program.

"Now that hostilities have ceased, the railroad administration will be judged by other standards than those of war necessities, and already the editorial columns of prominent papers are extremely critical of the operating and financial results of government control. In the opinion of your committee, there is nothing in the experience of the Government thus far to justify or encourage permanent public operation of the railroads either from the standpoint of economics or of service, and while doubtless the ardent advocates of public ownership will seek to capitalize recent experiences of the Government in favor of their theories, it is indisputable that those who travel

on the railroads and those using them regularly for shipping are anxious for the termination of direct government operation as soon as may be practicable.

"Prominence has been given in recent months, and is likely to increase, with regard to the financial condition of the street railways throughout the country. It seems to be universally recognized that no such company can continue to furnish good service and remain solvent excepting with a very substantial increase over the fare of 5 cents which has prevailed generally in past years. In a large number of cities relief has been granted the companies by fare increases to 6, 7 and 8 cents, with additional charges for transfers; but in many cases, because of franchise restrictions and the unwillingness of the regulatory bodies to meet the situation courageously and strictly on its merits, the condition of the street railway companies is rapidly becoming desperate. A condition which has contributed substantially to this result has been the raising of wages to employees of street railway companies by the War Labor Board, which Board, while emphatically recommending corresponding increases in fares, is without authority to enforce such recommendations.

"In the stress of conditions above outlined, it has been suggested in some quarters that the most practicable and effective solution of the street railway problem is in municipal ownership since, if the municipalities should acquire the street railways, the additional revenue required would be forthcoming either through increased fares or indirectly through taxation.

We recognize the extremity of the street car companies and the advantage that such suggestion may offer to some of them individually, but we deem it necessary to say that the opinion of your Public Policy Committee, as hitherto frequently expressed continues with increasing conviction that municipal ownership of electric lighting, gas and street railway companies is economically unsound and cannot redound to the mutual benefit of the consumers and the municipality. We think it is but fair to publicly reaffirm our views upon this subject at this time when temptation to the encouragement of municipal ownership by utilities companies themselves seems apparent.

"In this connection, your committee desires to call attention to the recent report of F. B. DeBerard, director of research of the Merchants' Association of New York, published in pamphlet form by the Association under the title of "Conditions Which Preclude Efficiency and Economy in Governmental Operation of Public Utilities."

A summary of the Merchants' Association's findings was published in the ELECTRICAL REVIEW of Feb. 8, 1919.

ILLINOIS CONTRACTOR-DEALERS HOLD INTERESTING MEETING.

All Interests Combine to Improve Situation—Louis Kalischer Principal Speaker.

The old adage concerning benefits to those who help themselves was cast aside by the spirit of co-operation which prevailed at the convention of the Illinois State Association of Electrical Contractors and Dealers at Chicago, Feb. 14 and 15, in favor of the more suitable one, "You Can't Help Others Without Helping Yourself." At this meeting manufacturers, jobbers, central stations and the members of other contracting organizations joined with the members of the Association in an attempt to improve the electrical merchandising and contracting situation which exists in Illinois, particularly in Chicago. And, if the frankness and sincerity which were demonstrated at this time are applied to these conditions, there is no doubt but that the meeting will have accomplished its purpose. J. A. Weishar, Rock Island, Ill., state chairman, presided at the meeting which, including the representatives of the various interests, had a total registration of about 300.

The original program was greatly interfered with by the absence of W. L. Goodwin, father of the "Goodwin plan" who was unable to be present. However, the Association was very fortunate in securing Louis Kalischer, of Brooklyn, N. Y., whose broad experience and clear understanding of the contracting situation, coupled with his ability as a speaker, served to bring out many new points of the plan. Mr. Kalischer has been very active in improving the conditions in the Manhattan district, which were in many respects similar to those in Illinois, and his ideas for the betterment of conditions in the latter state are particularly valuable on that account.

In opening his address Mr. Kalischer emphasized the need for closer co-operation between the contractors themselves. The old idea that a contractor must, for his own protection, keep his business and methods to himself has no place in modern times, but instead the largest and smallest should meet with "all the cards exposed" and endeavor to help each other. In this respect the small contractor must not expect the large contractor to come down to his level but should strive to elevate himself to a position where they can meet on a common ground. When this has been done and a real representative contractor's organization has been formed, no trouble will be encountered in securing the co-operation of the other branches of the industry.

The jobbers, for example, need the contractors' aid as badly as the contractors need them and if assured the support of the contractor will make any reasonable advance to secure it. This has been proven in the Manhattan district where many jobbers are contemplating going out of the retail business in favor of the dealer. It was pointed out that the jobbers would not lose anything by doing this for the larger distributing sales and the smaller overhead expense of conducting a strictly jobbing business would make up for the loss entailed in giving up retailing.

The central stations also realize the tremendous value of the contractor-dealer as a salesman for their interests and will gladly lend their support if granted the opportunity. These companies realize that the individual feeling which the public has toward the contractor is bound to beat them and that in spite of their size they cannot hope to do but a small portion of the total work. Therefore, they also, are willing to co-operate if assured that their interests will be carried forward.

The determining factor, however, is the extent and the value of the service which the contractor renders to the public and the other interests. His compensation in this, as in any other line of endeavor, depends entirely upon the value of this service. If this service is what it should be he can demand the respect of the other branches of the field and will receive it. If, however, the service is unsatisfactory or insufficient, these other interests will naturally refrain from placing any more responsibility upon the contractor

than is necessary. Furthermore, the public is entitled to a certain consideration and service which cannot be neglected, for after all public sentiment is the greatest asset any business man possesses.

Mr. Kalischer complimented the Chicago Electrical Estimators' Association on the work which it has done to improve and standardize wiring methods. Representatives of this association were present at the meeting and explained very fully its future aims and intentions together with the application of many of the plans which have already been introduced. These are reproduced more fully elsewhere in this issue.

E. W. Lloyd, general contract agent of the Commonwealth Edison Co., Chicago, explained the situation from the central-station standpoint very clearly. He pointed out the necessity of maintaining a normal average consumption by the central stations which is becoming more and more difficult. The increased efficiency of the modern electric lamps and the lowering of rates has forced these companies to resort to the sale of appliances, etc., and to encourage the use of electric service in every possible way in order to keep the average consumption up to a point where service can be distributed at a profit. It was Mr. Lloyd's opinion that many central stations which now engage in merchandising would gladly drop this work if the dealers could be relied upon to take it up and push it vigorously enough to maintain the consumption on the central-station company's lines. Speaking for the Commonwealth Edison Co., Mr. Lloyd explained that the merchandising policies of that company were the same as those employed by any successful retail store, that is, all goods were sold for a profit. In regard to the construction work which that company does, it is very small in proportion to the total amount done and in many cases it should be comparatively easy for the electrical contractor to underbid the company. This is especially true in cases where the company rents the fixtures for the percentage which must be added for protection enables the contractor to do the work much more cheaply than the central-station company can. It was pointed out that this company was willing to co-operate in every way possible with the contracting associations and further that recently some very definite steps had been taken in that direction.

Among the other speakers was C. E. Brown, of the Central Electric Co., Chicago, who spoke of the need for co-operation in sales between the contractor-dealer and the jobber and stabilizing of market conditions. He stated that the jobber should encourage wherever possible the local dealer and explained what his company was doing in this respect. G. A. Hughes, president of the Edison Electric Appliance Co., explained the difficulties which were encountered by the manufacturers during the war. W. A. Durgin, of the Commonwealth Edison Co., explained the work which this company had been carrying on with great success in increasing production in industrial plants by increasing the lighting intensity. F. R. Farmer, of the Beardslee Chandelier Co., Chicago, spoke on the new association of fixture manufacturers which was formed recently. Representatives of the Commercial Electrical Contractors' Association of Chicago were present and described the activities of that association and their proposed work for the future. Although not affiliated with the National Association of Contractors and Dealers it is expected that plans will be devised shortly whereby both organizations or their committees may meet to discuss their various problems.

The election of officers resulted in the following being chosen for the coming year: State chairman, R. W. Poelma, Peerless Electric Co., Chicago; secretary, N. M. Blumenthal, Chicago; treasurer, L. B. Van Nuys, Peoria. It was decided to hold the summer convention in Decatur. J. W. Collins, of Chicago, was chosen business representative of the Association with offices at 179 West Washington boulevard.

WAR-TIME AND SHIPYARD LIGHTING DISCUSSED IN NEW YORK.

Two Papers Presented at Illuminating Engineering Society's New York Section Meeting.

An interesting meeting of the New York section of the Illuminating Engineering Society was held Feb. 13. P. S. Millar, of the Electrical Testing Laboratories, New York, spoke upon "Lighting in War Times," and H. A. Hornor upon "Lighting in Shipyards."

Mr. Millar's talk was principally a review of the work done by the Committee on War Service of the Illuminating Engineering Society, in co-operation with the committee on Gas and Electric Service and the Divisional Lighting Committee. His effort was also to show the continued, if not more urgent, necessity for better and more efficient lighting in industrial plants now that the war is over. He called attention in particular to the survey made by W. A. Durgin in Chicago, where in every case it was found that by increasing the lighting in plants production was very materially increased. The subject of the use of carbon lamps as compared with Mazda lamps was brought up and the following interesting table presented, which shows that the Edison companies are making more rapid progress of late years in the use of efficient illuminants than the country as a whole.

Percentage of Carbon or Gem Lamps in Use.

Year.	Country at Large.	Assoc. of Edison Illuminating Companies.
1912	59%	75%
1913	43%	57%
1914	30%	42%
1915	21%	27%
1916	16%	15%
1917	13%	10%

The committee in its work for the Government was called upon to design means for protective lighting. This resulted in the preparation by the committee of a pamphlet of which 5000 were put out. This created a favorable impression in Washington and another edition had been called for just before the signing of the armistice.

Mr. Hornor drew attention to some of the difficulties in connection with the lighting of shipyards—problems which have never been solved satisfactorily and to which the illuminating engineer should turn his serious attention if we are to continue to build ships in the future.

In the building of ships there are so many small parts that grow into large parts rapidly that it is exceedingly difficult to keep the lighting up with the work, even with temporary wiring. This is true in the fabricating plants and on the ways. In the latter, the rapidly growing stagings shut off the light,

the whole lighting problem changes almost from day to day. So serious is this problem that before the necessities of war demanded it, shipbuilding at night was too dangerous to be considered.

TWO NEW ASSOCIATIONS FORMED AT FIXTURE DEALERS' CONVENTION.

Representatives of Fixture and Illuminating Glassware Manufacturers' Organize at Pittsburgh.

The convention of the Lighting Fixture Dealers' Society of America, held in Pittsburgh recently, was responsible for bringing two new trade associations into existence. Among those attending the convention of the fixture dealers were representatives of the leading fixtures manufacturers and manufacturers of illuminating glassware. These two interests organized associations of their own while in Pittsburgh—the National Council of Lighting Fixture Manufacturers and the Illuminating Glass Manufacturers' Association.

Fred R. Farmer, president of the Beardslee Chandelier Manufacturing Co., of Chicago was elected president of the National Council of Fixture Manufacturers; Albert Wahle, of Cassidy & Son Manufacturing Co., of New York, vice-president, and Chas. H. Hofrichter, of The Crescent Brass Manufacturing Co., of Cleveland, secretary and treasurer. Charles Ott, of the Eagle Glass and Manufacturing Co., of Wellsburg, W. Va., was elected to the presidency of the Illuminating Glass Manufacturers' Association, and Conrad J. Netting, of The C. J. Netting Co., of Detroit was re-elected president of the Lighting Dealers' Society of America.

Commenting on the organization of a fixture manufacturers' association, Mr. Farmer said: "The formation of a National Council of Lighting Fixture Manufacturers has been attempted many times before but without success. This year a new spirit seemed to animate the representatives of the industry—a spirit of co-operation—a realization that individual interests must be subordinated to the common good. There is much work of an educational nature that we can do better collectively than individually. The radical improvements that have been made in recent years in lighting fixtures are not generally known. People are still satisfied with the inartistic and inefficient fixtures installed a decade ago because they do not realize the greater comfort and economy of modern fixtures. We believe that by closer co-operation with fixture dealers we can greatly augment the volume of replacement business. Another object of our National Council is to suppress existing trade evils, particularly the practice of copying one another's designs."

The next meeting of the National Council of Lighting Fixture Manufacturers will be called early in the summer to perfect organization. Any fixture manufacturer who would be eligible for membership in a local association of fixture manufacturers is eligible for membership in the National Council.

ADDITIONAL RESEARCH ASSISTANTSHIPS ESTABLISHED BY UNIVERSITY OF ILLINOIS.

Opportunity for Graduates to Assist in Research Work in Engineering Experiment Station.

To assist in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen research graduate assistantships in the Engineering Experiment station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $500 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry.

An appointment to the position of research graduate assistant is made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred. Not more than half of the time of a research graduate assistant is required in connection with the work of the department to which he is assigned, the remainder being available for graduate study.

Nominations to these positions, accompanied by assignments to special departments of the Engineering Experiment station, are made from applications received by the Director of the station each year not later than March 1. The nominations are made by the Executive Staff of the station, subject to the approval of the president of the university. Nominations are based upon the character, scholastic attainments, and promise of success in the principal line of study or research to which the candidate proposes to devote himself. Preference is given those applicants who have had some practical engineering experience following the completion of their undergraduate work. Appointments are made in the spring, and they become effective the first day of the following September.

PROFESSOR CLEWELL LECTURES AGAIN ON INDUSTRIAL LIGHTING.

The monthly meeting of the Philadelphia section, Illuminating Engineering Society, took the form of a joint session with the Franklin Institute, and was held in the lecture hall of the Institute in Philadelphia on the evening of Feb. 6. The paper of the evening was presented by Prof. C. E. Clewell, on the subject "Industrial Lighting." It dealt in an especially interesting and non-technical manner with the necessity of improving lighting used in industrial operations, and with the ways in which this is easily and economically possible. A large number of slides were exhibited, also the latest type of photometer, which is light and compact, and can be used to demonstrate to the layman the relative amounts of illumination at the various points which are being investigated.

ASSOCIATED MANUFACTURERS TO HOLD ANNUAL MEETING IN MARCH.

The fourth annual meeting of the Associated Manufacturers of Electrical Supplies will be held at Delmonico's, New York City, on March 20. The election of five governors for the organization and other important business will come before the meeting. In the evening of the same day the fourth annual banquet will be held in the grand ball room of Delmonico's. This will be a social event, with entertaining speakers, music, etc., to which members may invite guests. During the week of the annual meeting there will be meetings of 19 different sections of the association. Charles E. Dustin, 30 East 42nd street, New York, is general secretary.

Commercial

Facts and Figures on Unique Seasonal Pumping and Heating Load — Brooklyn Edison Report — Electrical Cooking

CONDITIONS AND COSTS OF ELECTRIC HEATING ON MINIDOKA PROJECT.

Electric Pumping Plant for Summer Irrigation Produces Heat in Winter—Low Costs of Heating Service Applicable to Peculiar Conditions—Minidoka and Arrow Rock Conditions Different.

The ELECTRICAL REVIEW of Dec. 28, 1918, contained a brief news article referring to a meeting of the Idaho Public Utility Commission, at Boise, when the proposal was discussed to ask the United States Reclamation Service to install hydroelectric equipment at Arrow Rock dam, on Boise River, to supply energy for electric heat to cities and farms during the late autumn and winter when no water was required for irrigation purposes. Opposition to the plan was expressed at this meeting, the grounds for which being that power for this purpose at Arrow Rock could not be made dependable and that the cost of electric heat under such conditions in that locality would far exceed that of coal heat.

The supply of power for electric heating for farmers and town consumers from the Government hydroelectric plant at Minidoka dam, on the Snake river, at a cost which has stimulated a constantly increasing power load was admitted, but the opponents of the Arrow Rock plan virtually said that power was produced at the Minidoka project under conditions which could not prevail at Arrow Rock.

The conditions differ in one respect, which is that an electric pumping plant is required at Minidoka to irrigate the higher benches of land, allowing the generators to produce power for heat during the season when pumping water is not required; while at Arrow Rock, where no pumping is needed, the proposed hydroelectric plant could be utilized only to supply light and heat to consumers in that section of the country. During the irrigating season when the maximum volume of water must be diverted from the storage basin above the dam, there would be a period of low power production, but this would also be at a time when heating requirements were at the minimum.

ELECTRIC PUMPING AND HEATING SERVICE ON MINIDOKA PROJECT.

In this connection a review of conditions and electric power costs on the Minidoka project will be of special interest. The data are taken from a report recently made by Barry Dibble, project manager, United States Reclamation Service, at the request of the Idaho Public Utility Commission.

The generating station, built primarily for electric pumping, has a rated capacity of 7000 kw., with a maximum of 7800 kw., practically all of which is required for electric pumping water during the irrigating season. The ordinary commercial lighting and miscellaneous power load on the system, has developed in 10 years to a maximum demand of 750 kw., although the connected load, if all lamps, motors and appliances were used at once, would amount to 3478 kw. In the matter of developing an electric-heating load, Mr. Dibble says:

"At the time this subject was under consideration, in 1909 and 1910, the Great Shoshone & Twin Falls Water Power Co., operating in the territory immediately west of Minidoka project, was carrying out with some success experiments in electric heating for dwellings and other buildings. This heating load appeared to be the only one that could be secured that would satisfy conditions of the Minidoka system. These permitted carrying a heavy load in winter, but required that the demand be reduced to practically nothing in the summer. It was apparent that electric heating would have to be supplied at much lower than the customary rates for electricity in order that it might supplant coal. However, in supplying electricity for heating, use was to be made of a power station that was already installed and operated for other purposes, and a transmission line which was needed to supply the ordinary requirements of the towns. Therefore, the additional expense of carrying the heating load was confined to the extra substation equipment and to the additional copper and transformer capacity needed by the retail company in distributing electricity to consumers, together with an allowance for bookkeeping and other operating expenses."

It is shown that in a few years the heating load so increased as to require a duplicate transmission line 13 miles long at a cost of $11,000, and that demand for electric heat in 1917 was indicated by the following facts: The substation at the town of Rupert, with a population of about 2000, carried a load of 2000 kw.; Burley, having a population of 3500, carried 2500 kw. In both cases the heating consumption amounted to 90% of the entire load. The maximum heating load for that year on the system was 4707 kw., including substations that served smaller towns and rural districts.

The Reclamation Service generates, transmits and transforms electrical energy, delivering it at the substation switchboards to distributing companies by which the consumers are served, those companies assuming the additional cost incident to such retail service.

In the matter of estimating the costs of supplying electric heat in towns on the Minidoka project, Mr. Dibble states that two methods of computation are used: The first, to arrive at additional expense caused by the heating load; second, to determine the charge that the heating service would have to bear if it were to carry its proportionate share of the costs of the entire electric system.

In the first case, it is assumed that no additional expense at the power house is necessary, because of the heating load, as the power plant must be operated to supply lighting and ordinary appliances; that

no additional attendance is required; that the extra oil required is negligible, and that the extra wear and tear due to operating is not greater than would be the deterioration if some of the units were either idle or operating at a fractional load. It is assumed that in this case electric heating should bear an expense for transmission lines proportional only to the additional investment in lines made necessary because of the heating load. No charges to heating costs are made in connection with substation operations because it is assumed that the inspection, meter-reading, etc., of a small substation would be about the same as at a large one. However, costs of maintenance and depreciation, which materially increase on account of greater transformer and switchboard capacity required for the heating load, are divided in proportion to the "light and appliance" and "heating" peaks of the year, making the heating charge 84.6% of the total.

Based on the foregoing outline, the additional cost to the Reclamation Service of electric heating in this project for 1917 is summarized in the following table:

Table 1.

	Total.	Max. Demand.
Power house	None	
Transmission lines:		
Operation	$ 158.80	
Maintenance	251.50	
Depreciation	1,080.00	
Subtotal	$1,490.30	$0.32
Substations:		
Operation	None	
Maintenance	3,754.63	
Depreciation	2,030.00	
Subtotal	$5,784.63	1.23
Sale of electricity	2,037.00	0.43
Total	$9,312.23	$1.98

The average revenue derived by the Reclamation Service from the sale of energy for heating for 1917 was $3.78 per kw., and figuring only those costs listed above, the heating feature of the business showed a surplus of $1.80 per kw. for that year.

In the report referred to it is stated that no concern could operate long if it omitted from its cost computation all items except the additional ones incurred in handling a particular line of business. The practice of the Reclamation Service is to prorate all expenses to the features benefited. Thus, the power-house costs are divided in proportion to the number of kilowatt-hours delivered for various uses. For instance, on the Minidoka system for 1917, there was delivered 38,500,000 kw.-hr., of which 19,700,000 was consumed in electric pumping, and 18,800,000 was sold. Of the volume of energy sold, nearly 15,800,000 kw.-hr. was for electric heating.

At the close of 1917, there had been built 26.8 miles of transmission line to serve the pumping stations, and 46.6 miles to meet commercial demands, and their costs have been divided between the pumping and power units in proportion to this mileage. Then, the operating charge to the power units was divided so that the heating service carried an amount proportionate to the kilowatt-hours used for that purpose.

The cost of heating service, based on average cost per kilowatt-hour for 1917, is presented in Table 2.

Table 2.

	Total	Per kw.-hr.	Per kw. of Max. Demand
Power house:			
Operation	$ 5,750.00		
Maintenance	1,561.46		
Depreciation	6,123.24		
Subtotal	$13,434.70	$0.00083	$2.86
Transmission lines:			
Operation	$ 464.09		
Maintenance	735.15		
Depreciation	3,167.60		
Subtotal	$ 4,366.84	0.00027	0.93
Substations:			
Operation	$ 1,117.22		
Maintenance	3,842.63		
Depreciation	2,078.00		
Subtotal	$ 7,037.85	0.00043	1.49
Sale of electricity	4,795.40	0.00030	1.02
Total	$29,634.79	$0.00183	$6.30

It is observed that had there been no summer irrigation load on the power house against which about half of the annual expense could be charged, then the heating load would have had to bear approximately double the power-plant charges shown in the second table. A conclusion is that in such a case the investment in a power house could not have been justified.

Relative to dividing costs the report says: "It has long been recognized as a principle of rate-making that if a system is underloaded it is justifiable and good business to take on a load that will more than pay the extra expense it entails. Such a load, while it may not carry its prorata share of costs, at least helps in some degree to meet the fixed expenses that otherwise would have to be met from other sources."

Comparing the costs of coal and electricity on the heat unit basis, it is observed that available coal at Minidoka is assumed to contain 12,000 B. t. u. per pound; and after allowing for losses in heat, unburned coal in ashes, waste and slacking, its assumed efficiency is 33⅓%, and that 8,000,000 B. t. u. may be effectively used in a ton of coal. One kw.-hr. of electricity is the equivalent of 3416 B. t. u. and a kw.-month to 2,450,520 B. t. u. A given amount of electricity delivered is capable of 100% efficiency converted into heat. In Idaho electricity for heating is sold on a flat rate per kilowatt of demand for the month or season. Inasmuch as the consumer cannot use electric heat every hour of the day, nor every day of the month, the efficiency in its use is estimated at 66⅔%; and from this it is figured that one ton of coal per month is equivalent to about 5 kw. when used for heating. The conclusion reached as to the Minidoka project service, is that electricity at $1.60 per kw. per month of maximum demand is equal to coal at $8 per ton.

The cleanliness and convenience of electric heat is taken into account, and as is stated, if the consumer is for this reason willing to pay 25% more for electricity than for coal, the indications are that electricity at $2 per kw. per month will compete with coal at $8 per ton. As the average heating load season on the Minidoka project is five to six months, the retail revenue that may be expected from this part of the business runs from $10 to $12 per kw. per season.

It is further stated that if electricity for heating were sold by meter at kw.-hr. rate it would result in

reducing the kw.-hr. consumption. The cost of supplying this load depends upon the maximum demand rather than upon the length of time the demand is used. The revenue per season must be the same per kw. of maximum demand, and, therefore, the reduction in kw.-hr. consumption on a metered basis would have to be met by a corresponding increase in the rate. It is found that when electricity is sold on a maximum-demand basis the tendency is to keep down the peak by closing some of the rooms in extremely cold weather. If sold on the kw.-hr. basis, consumers would be inclined to put on additional heaters for cold weather, increasing the demand and therefore the necessary power equipment; and as the use of this additional equipment measured in kw.-hrs. would be slight, the average rate would have to be increased to cover the extra costs.

The reader is reminded that the data herewith given apply to the peculiarly favorable conditions on the Minidoka project, and cannot be safely applied to other power systems.

BROOKLYN EDISON HAS GOOD YEAR IN SPITE OF CONDITIONS.

Annual Report Gives Employes and Management Credit for Success.

Considering the many unusual and difficult situations presented due largely to the war conditions the recent annual report of the Brooklyn Edison Co., Inc., of Brooklyn, N. Y., is very satisfactory. Not alone did the price of coal, the source of all the energy produced, show a large increase, but higher labor costs and the scarcity and uncertainty in delivery of essential material and supplies combined with it to materially increase expenses. On the other hand, the lightless nights, workless days and daylight saving plan all tended to reduce the revenue.

The results have been large attained through the loyal support of the management by an energetic and patriotic corps of employes, many of whom were at times carrying extra duties, due to constantly changing conditions, the influenza epidemic and the absence in service of their former associates. Every endeavor was made to help win the war, and at the same time promote the conservation of capital. The sales force was reduced to a minimum, and devoted its time in attending the needs of the Government, furthering the development of essential war industries, and obtaining additional business from existing customers, thereby augmenting the revenue of the company with a minimum of expense.

Contracts were signed for 52,000 hp., and included installations for shipyards; the great army and navy bases at South Brooklyn; manufacture of torpedoes, ammunition, gyroscopes, stabilizers, searchlights, gas-mask parts, shoes, uniforms, food products and various other war necessities. Twenty-two private plants were discontinued in favor of the company's service during the year.

The summary of business obtained during the year as compared with 1917, and the total number of customers, is as follows:

	1918.	1917.	Increase.
Total contracts signed.....	38,478	43,178	4,700[1]
Number of customers, Dec. 31	99,262	86,777	12,485

[1]Decrease.

The resultant increase in current output was as follows:

Kw-hr. sold	218,977,825	202,823,791	16,154,034
Largest daily output in kw-hr. generated	1,135,000	998,000	137,000
Maximum load in kw. generated	86,000	78,000	8,000

During the last year a 12,500-kw. high efficiency turbogenerator was installed at the Gold street station, replacing a 5000-kw. turbine. A similar machine was installed complete with its auxiliary equipment at the 66th street station, and a third of the same size should be completed at this station during the early part of this year. In addition, transforming apparatus, totaling 24,000 kw., has been installed in the various substations, together with auxiliary apparatus.

The plan which was adopted in 1910 of giving the employes a dividend on their wages based on the time of service with the company was approved again this year. Since the inception of the plan, 414 employes have become stockholders of the company and a total of 2,186 shares of stock are now owned outright by the employes.

The indications are that the present year will see to a large extent the transition throughout the country generally from a war to a peace basis. The company will, it is believed, be able to adjust itself to the changing conditions, and with the continuance of its established policy of economical management and a judicious campaign for new business, should be able to attain results that will prove acceptable.

ELECTRICALLY PREPARED LUNCHEON GIVEN IN ST. PAUL.

Low Current Consumption Feature of Meal Cooked on "Hotpoint" Range.

During the recent annual conference of the Northwestern Electric Equipment Co. of St. Paul, Minn., held recently at the St. Paul Hotel in that city, 45 members of the sales and executive staff of the company were tendered an electrically cooked luncheon by the Hotpoint Division of the Edison Electric Appliance Co. of Chicago. The meal was entirely prepared on a Model D, Hotpoint range manufactured by the latter company, and is unique in that the total current used was only 7782 watts which at 4 cents per kw-hr. amounts to 31.128 cents for the full meal or .00691 cents per person.

MENU.

Switches (Celery) Insulators (Olives)
Transformer Oil (Chicken Soup) Braces (Wafers)
"Heart of the Range" with H. P. (Hotpoint) Sauce.
(Roast Beef, Meat Sauce)
Chafing Dish Service
(Potatoes and Peas in Cream)
Bushings
(Sweet Corn in Ramekins)
Standard Oven (Raisin Bread) Ovenettes (Sweet Rolls)
Insulation (Head Lettuce Salad)
Day Load (Plum Pudding) High Voltage (Hard Sauce)
Percolation (Coffee) Binders and Fittings (Cheese Straws)
Hot Point Ideals (Cigars)

The extremely low consumption is accounted for by the utilization of stored oven heat—one of the greatest essentials in successful range operation. The current consumption of the surface burners, of which three were used, was 2682 watts. The following are the figures on the wattage consumption of the various items which comprised the menu:

10 cans soup	469 watts
18 lbs. roast beef	2325 watts
1½ pecks potatoes, 2 cans peas	1188 watts
5 cans corn	300 watts
6 loaves bread	1000 watts
5 dozen rolls	700 watts
50 portions pudding	1275 watts
70 cups coffee	525 watts

The luncheon was prepared under the auspices of A. H. Jaeger, the northwestern sales representative of the Edison Electric Appliance Co., Hotpoint Division, who was assisted by Bernice Bell, domestic science expert of the Northern State Power Co., who was responsible for the preparation of the viands.

Operating

Problems in Parallel Operation—Underground Construction Costs—Duct-Cleaning Tool—Feed-Water Temperatures

SOME PROBLEMS IN THE OPERATION OF POWER PLANTS IN PARALLEL.

Abstract of Paper Read Before Pittsburgh Section A. I. E. E.

By E. C. Stone,
System Operator, Duquesne Light Company.

In order to operate two power plants satisfactorily in parallel, the transmission line which ties them together must have sufficient synchronizing power as well as sufficient capacity to carry the maximum load to be transmitted between them. The synchronizing power of a given line depends upon its resistance and reactance, upon the bus voltages maintained at its ends, and upon the maximum kilovolt-amperes it must transmit. The ability of different lines to provide satisfactory parallel operation cannot be measured by any standard which does not take account of all of these factors. It has been found from the writer's experience that a "synchronizing power" about equal to the kilowatt capacity of the smaller plant to be paralleled, for large turbine plants with load fluctuations of relatively small percentage of their capacity, and of 1.5 times the smaller plant capacity for mixed engine and turbine plants with relatively large load fluctuations, is about the least that a line can have to give satisfactory parallel operation.

When the voltage per mile of transmission is high, line capacity, as determined by load and operating conditions at the two stations, rather than synchronizing power, is the limiting factor; when the volts per mile is low, synchronizing power more often marks the limit, especially when the reactance is high and the load to be transmitted relatively small. The necessity of sufficient line synchronizing power applies equally whether generators or loaded synchronous motors are at the end of the line, but is unimportant in connection with synchronous condensers at the end of the line.

The design of equipment for transmitting a block of power over a given distance at minimum cost must take into account the use of synchronous condenser capacity at the receiving end of the line. The condenser is effective in raising the receiving voltage as well as in controlling the transmission power-factor, and materially reduces the amount of copper required in the line. The amount of condenser capacity which may be economically used depends on the power-factor of the load, the relation between the cost of line capacity and condenser capacity, and the reactance resistance ratio of the line. Where this ratio is high, sufficient condenser capacity may be justified to produce a considerable leading component in the tie line current. In a line of given resistance, with the receiving voltage unregulated, the total cost of transmission increases slightly with the increase in reactance.

Where synchronous machines of sufficient capacity, either condensers or generators, are installed at both ends of the line, the bus voltages of both stations can be maintained constant as the load transmitted over the tie line varies, by the creation of a wattless cross current, which increases as the load transmitted decreases. This wattless current, however, involves an additional cost in copper loss and in the wattless generating capacity required to take care of it, which is small when the reactance resistance ratio of the line is sufficiently high, but which rapidly increases as the reactance decreases, and for low line reactances becomes very important.

This wattless cross current, which develops on light loads, can be materially reduced under certain conditions, by varying the voltages at the ends of the line through the use of transformer taps, by inserting additional reactance in the line at light loads, or, when the stations are tied together by several parallel lines, by cutting out one or more lines as the load decreases.

The increase in the cost of transmission with constant bus voltages, caused by this wattless cross current represents the cost of eliminating the regulation of the tie line. The wattless cross current decreases as the reactance resistance ratio of the line increases, but the synchronizing power also decreases. Hence it will be generally found that the best design of transmission equipment for constant bus voltages is that which makes the reactance of the line as high as is permissible for the synchronizing power required. With such a design, the cost of maintaining constant bus voltages—that is, of eliminating the regulation of the tie line—does not amount to more than a few percent of the total cost of transmission and is a very small price to pay for the operating advantages gained. It must be remembered, however, that to obtain constant bus voltages at this slight cost, the installation of sufficient wattless capacity at the receiving station is absolutely essential—a feature, unfortunately that is too often lacking in existing transmission systems.

COST OF CONDUIT AND TUNNEL CONSTRUCTION.

Valuable Data Compiled by Commonwealth Edison Company.

By G. B. Springer.
Commonwealth Edison Company.

While it is very difficult to give an accurate set of figures on the cost of conduit construction, due to the varying conditions in different cities, such as the cost of labor and material, character of soil, obstructions, etc., a fair average may be obtained which will be sufficiently close for rough estimates.

The following costs are for conduit line complete, including manholes, but excluding the cost of repav-

ing. Labor amounts to approximately 40% and material 60% of the total:

No. of ducts.	Cost per duct foot.
2	$0.35
4	.23
6	.21
9	.20
12	.19
16	.17

For more accurate estimates the conduit and manholes should be figured separately by the following costs, excluding manholes, repaving and cost of pipe:

CONDUIT.

No. of ducts.	Cost per duct foot.
2	$0.20
4	.11½
6	.10½
9	.09½
12	.08½
16	.07

MANHOLES.

3 by 4 ft.	$50.00
4 by 4 ft.	60.00
4 by 5 ft.	70.00
5 by 5 ft.	100.00
5 by 6 ft.	115.00
6 by 6 ft.	130.00
6 by 7 ft.	145.00
7 by 7 ft.	160.00
7 by 8 ft.	175.00
8 by 8 ft.	190.00
9 by 9 ft.	210.00
10 by 10 ft.	240.00

To all of the above figures should be added the cost of repaving, which is borne by the company doing the work.

The average cost of repaving in large cities is shown by the following, the terms "in reserve" and "out of reserve" used in some localities meaning that where a five-year guarantee is required by the city on new paving, the original contractor for the work shall do all repairing at figures fixed by the city. Where a pavement is out of reserve or the five-year guarantee has expired, the repaving may be done by the city or other contractors at prices fixed by agreement.

	——Price per sq. yd.——	
Kind of pavement.	In reserve.	Out of reserve.
Granite block on macadam		$1.60
Granite block on concrete	$2.50 to $3.00	1.65
Brick on macadam		1.00
Brick on concrete	2.80 to 3.00	1.40
Macadam, granite top	1.00	.80
Macadam, limestone top		.40
Creosoted block	3.00 to 4.00	2.50
Asphalt	2.50 to 3.00	$2.50 to 3.00

The costs of conduit and manholes given are based upon the following unit costs of material and labor:

First cost of conduit, per duct ft.	$ .05
Iron pipe for laterals, per duct ft.	.20
Brickwork, including labor and material, per cu. yd.	13.00
Concrete roofs, including labor and material, per cu. yd.	10.00
Concrete bottoms, including labor and material, per cu. yd	7.00
Sewer connections, including labor and material, each	12.50
Crushed limestone, per cu. yd.	1.75
Sand (torpedo), per cu. yd.	1.75
Sewer permits, each	7.50
Manhole frames and covers, each	18.00
Backwater valves, each	3.25
Sewer grates, each	.30
Cement, per bbl.	1.45
Brick, per thousand	8.00
Angles, T-irons and I-beams, per lb.	.05
Labor, per hour	25 to 30c
Storeroom charges on all materials furnished by the company	7%
Inspection (of total cost)	4%

Tunnels, like conduits, vary greatly in cost according to the kind of material through which they are driven and the difficulties encountered in building, but an average in the cost of eleven tunnels, four of which were built in rock and the remainder in clay, gives a fair approximation of the cost of this work which may be used in estimating similar work.

AVERAGE COST OF 6-FT. CONCRETE TUNNELS PER LINEAL FOOT.

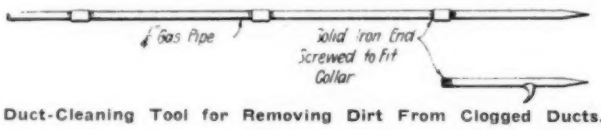
Tunnel in clay	$24.00	Shaft in clay	$56.00
Tunnel in rock	33.00	Shaft in rock	72.00

SERVICEABLE DUCT-CLEANING TOOL.

Sections of Gas Pipe Make Useful Appliance.

When duct lines are washed out by the bursting of high-pressure water mains and similar causes, it frequently happens that the ducts in the adjacent undamaged sections of dust become choked with *débris* for considerable length on either side of the break in the ducts. This clogging is usually more troublesome in the ducts not carrying cable, and may extend as far as the manholes.

The accompanying illustration shows a useful form of duct-cleaning tool, that is light, easily transportable, occupies little space, is of long life, costs little, and can be made from material easily obtainable. This tool consists of sections of gas pipe, each section of convenient length, connected together by the ordinary gas coupling. The end of the tool may be varied according to the form of *débris* in the duct, and whether the *débris* is to be pushed ahead through the duct or drawn out in the direction it went in. For this latter purpose the tool point should be equipped with a hook, as shown at the bottom of the illustration. The end units should be of solid iron, because of the greater strength.



Duct-Cleaning Tool for Removing Dirt From Clogged Ducts.

A duct-cleaning tool made up of sections of gas pipe can be dismantled quickly and easily carted around; is built up rapidly and is comparatively light for its strength.

FEED-WATER TEMPERATURES AND FUEL SAVING.

Speaking generally, 1% of fuel is saved for every 11° rise in the feed-water temperature, provided the heat producing this rise in temperature would otherwise be wasted. Notwithstanding this, in many stations heat is being thrown away which could easily be recovered for heating the water. The exhaust from at least a portion of a small auxiliary plant, should be directed through an oil separator, to the feed water tank, rather than to a condenser, until a maximum temperature of, say, 200° F. is obtained. In the case of reciprocating engines, it is often more economical to give the feed water temperature first consideration, in preference to high vacuum.

WOMEN AS STATION OPERATORS.

Four women are employed as station operators by the Georgia Railway & Power Co., Atlanta, Ga. These women act as assistant operators in stations containing synchronous converters for railway service, and take readings of switchboard meters, watch the load, close circuit breakers and do general switching and synchronizing the rotaries. They have given entire satisfaction.

Contracting-Construction

Estimators' Association Described to Contractors — Cost Systems for Contractors—Iowa Contractor-Dealers Meet

HOW THE ESTIMATORS' ASSOCIATION CAN HELP ELECTRICAL CONTRACTORS.

Aims and Intentions for Future Activities as Outlined to Contractors at Recent Meeting.

Although but slightly more than one year old, the Chicago Electrical Estimators' Association has in its short existence risen to a prominent place in the electrical construction field. During this time it has developed and introduced several plans and methods which have served to establish the contracting business on a firmer basis and standardize estimating. Among these achievements are the unit labor prices, chart of overhead percentages and a set of practical estimating forms.

At a recent meeting of the Association a brief outline of its purposes and aims was drawn up and several changes were made in the organization. Among the changes the principal one was the creating of a treasurer. Formerly no membership dues or initiation fees have been charged but it was found advisable to make a nominal charge in the future. Membership is open to anyone in Chicago who does electrical estimating either as a hired estimator or a contractor who does estimating in connection with his contracting business. At this meeting the following officers were elected for the coming year: President, Albert Uhl, Henry Newgard Electric Co.; secretary, E. S. Steiner, Beaver Electric Co.; treasurer, E. L. Morley, L. K. Comstock Co.

Future Work of Association.

The future work of the Association as well as its value to the contracting business was brought out in an address delivered before the Illinois State Association of Electrical Contractors and Dealers recently by John R. Smith, former secretary of the association.

Estimating is truly the heart of the contracting business, for ultimate success depends upon this more than upon any other single item. Furthermore it is the most interesting phase of the work and one which readily lends itself to and needs developing. That a group of estimators meeting to study this subject is bound to be of great help to the contractor is not to be questioned and deserves the active support not only of the contractors themselves but of all interests affiliated with them. The question therefore is not whether an estimators' association is needed but whether the Chicago Electrical Estimators' Association is the one to be supported.

This subject naturally resolves itself into three questions: First, what has this association already done for the contractors? Second, what are the future plans and expectations of the association? Third, how may the contractors' associations derive the most benefit from the work already done and that which is contemplated?

The first question has already been answered. The value of the "labor unit" prices for electrical contractors has been proven, and further evidence of the value is shown by the manner by which they were received at the national convention in Cleveland. At the state convention in Peoria the association presented a series of estimating forms which are now being used successfully in many places. An accurate method of determining overhead percentages has been introduced which has been accepted by many authorities as the greatest advance made in eliminating this source of trouble to the contractor. The latest development is a series of unit prices to be applied to extra work which may occur on contracts and which although not entirely complete are worthy of consideration.

These results constitute but a small beginning for the work to be done. Even the subjects touched upon are by no means finished and when the great number of other subjects available and needing improvement are known this fact is easily realized. The association has outlined a few of these subjects upon which to direct its operations during the coming year. These are: Labor units for knob and tube work, overhead line construction, underground construction, transformer-room construction and central-station installation work. These subjects offer plenty of work for all and merit the hearty co-operation of the various interests.

How the Contractors May Benefit and Aid.

The value to the contractor is evident. In the first place he and his estimators receive accurate information on the various methods and improvements in estimating which help them immeasurably in their work. In addition, through the distribution and application of such information the contracting business will be placed on a much more substantial and stable basis which will undoubtedly serve to benefit the whole industry.

To secure the least results, however, it is essential that the contractors co-operate in every possible way with the estimators and help them secure information. In the larger cities they should encourage and foster such associations by sending their estimators or, if they do their own estimating, go themselves to meetings at which these subjects may be discussed. If it is not advisable to form separate organizations, sections of the local contracting associations should be formed to take up this work. This will add considerable interest to the meetings, which in turn will tend to create a better feeling toward each other and perhaps serve to increase the membership.

When this has been done a national organization or section could be established which would serve as a clearing house for the interchange of ideas and prove a great aid in gathering the necessary information. It is expected that the National Association of Electrical Contractors and Dealers will establish such a clearing house in the near future.

COST ACCOUNTING FOR ELECTRICAL CONTRACTORS.

Pacific Coast Firm Engages Expert to Introduce Cost System and Other Modern Business Methods.

The importance of proper cost accounting is rapidly becoming recognized by the electrical contracting fraternity in nearly all parts of the country. In order to set an intelligent selling price in the contracting or merchandising branches of the business it is necessary to know exactly what are the actual costs of carrying on these or other lines of the business. For this reason the National Association of Electrical Contractors and Dealers has actively taken up the subject, as have a number of the state associations, notably Wisconsin, Massachusetts and the Pacific coast states.

At least one enterprising electrical contracting firm has taken further action in this matter. The Jaggar-Sroufe Co., Portland, Ore., in anticipation of an expansion of business, has engaged as business manager,

Walter E. Conklin.

Walter E. Conklin, whose past experience has been along lines of business efficiency, cost accounting and office management. Mr. Conklin is putting into effect a carefully developed system of accounting adapted to the electrical contracting business.

Contractors in other portions of the country may find this a very appropriate time to put their houses in order for the oncoming resumption of general building, during which they may be so busy as to find little time to devote to the development of modern business methods, for absence of which their business may be seriously handicapped. There are available competent business experts for just this very service. Like the trained efficiency engineer in an industrial organization they can introduce methods of cost accounting, office and store record systems, and other efficiency ideas that will stop leaks and losses, and enable the contractor to know exactly what it costs him to conduct every department and to know just what his profit or loss really is.

IOWA CONTRACTOR-DEALERS MEET.

Many Topics of Interest Discussed at Des Moines Convention. Election of Officers.

The Iowa State Association of Electrical Contractors-Dealers held an interesting meeting at the Hotel Chamberlain, Des Moines, Iowa, Feb. 10-11. Officers for the ensuing year were elected as follows: G. N. Holloway, Mason City, chairman; H. J. Ryan, Sioux City, treasurer; and F. Bernick, Jr., Oskaloosa, secretary. The executive committee consists of the above officers and E. N. Armstrong, Des Moines; A. C. Rohwer, Denison; Edward Kunkle, Davenport; and W. F. Fowler, Cedar Rapids. The banquet served at the Chamberlain Hotel was an enjoyable part of the program, as was also the "special entertainment" provided by R. H. (Bob) Bloodgood, representing the Commercial Electrical Supply Company of St. Louis, Mo. Mr. Bloodgood is said to be a star entertainer and is not only a good electrician and a salesman among electricians but has rare entertaining ability to interest his brothers in the profession which he demonstrated on this occasion.

The meeting was throughout an interesting and profitable one. The contractors and dealers believed the meeting to be one of the best ever held both from an educational and a financial standpoint. "All the latest kinks in the application of electricity were explained by experts, said Mr. Holloway, the new president, "and we are returning to our several places of business with a new vision of the work of the electrician as a public servant." The duty of the electrician upon the farm received especial attention at the meeting, the connection between the work of the electrician and the Iowa farmer who raises such good hogs, cattle and corn being carefully discussed. Ole Roe, state fire marshall, talked to the assembled electricians upon "Property Conservation." Other addresses were Evan J. Edwards, Cleveland, O., on "Electricity on the Farms"; A. L. Rich on "Labor Costs," and Ward Harrison, Cleveland, O., on "Industrial Lighting." Mr. A. H. Rich of the Electrical Equipment Company of Des Moines, welcomed the guests to Des Moines and was the toastmaster at the annual banquet. The meeting next year will also be held in Des Moines.

PROFESSIONAL AND SPECIAL SECTION EXTENDS SERVICE.

Future Activities to be Directed Towards Reconstruction and Peace Needs.

The Professional and Special Section of the United States Employment Service, formerly located at 299 South La Salle street, has removed to new and more extensive quarters at 63 East Adams street, Chicago. This Section, formerly known as the Division of Engineering, will enlarge its service to include all kinds of professional and technical men and women.

During the war this branch of employment did notable work in placing engineers and technical men in various branches of the war and the Government. Now its activities will be directed toward reconstruction and peace needs. It will serve employer and registrant alike and will strive to place the best man in the place where he is most needed. No charge is made for this service.

Engineers and professional men and women desiring the services of the Professional Section are requested to write to the above address for registration blanks. In order to secure quick service, applicants are advised to communicate with the branch of the Professional Service which has jurisdiction over their zone district. Those people living in Illinois, Indiana, Iowa and surrounding territory should register with the Chicago office.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 455.—Rates for Electric Service During Construction.—There are a large number of electrically driven construction devices which are only used temporarily during the course of construction or remodeling of buildings. Such apparatus includes hoists, floor polishers, small portable pumps, concrete mixers, etc. As they are only used for a short time, and usually by different contractors, considerable trouble has been experienced in establishing a definite equitable rate of charging for the service which they use. The installation of meters in such cases has been found unsatisfactory, as they are very liable to injury, and the total consumption of the apparatus is often less than the cost of installing the meter. Will some readers explain the methods by which a flat rate charge may be drawn up and also the methods followed in charging for service connections where such are necessary?—H. J. W., Kokomo, Ind.

No. 456.—"Fieldless" Motor.—I was called on to look over a newly rebuilt 10-hp., shunt-wound, 110-volt direct-current motor which had been recently installed and was not giving satisfactory service. While working on the machine, I found it was running with one side of the field coil winding open. Not having a voltmeter handy, I disconnected the other connection between that coil and the next, thinking possibly the field winding was grounded in one of the four field coils. I continued to disconnect the field coils, one from the other, each time trying the motor until I had all the four field coils disconnected and the machine showed no bad effects whatever, but continued to run an 8-hp. pump to which it was belted just as well as if the field coils were connected. This motor was bought for and is stamped 650 rpm., constant speed, but runs at nearly 1500 under load and makes over 2000 if belt comes off. Name plate is stamped "8 hp. open" "10 hp. closed." The machine is supposed to be a type CQ General Electric. Why will this motor develop nearly full horsepower with all field windings, open? Why does it run at excessive speed? Why does it run away when belt comes off? What does "open" and "closed" refer to?—F. G. H., Hairston, Ala.

Answers.

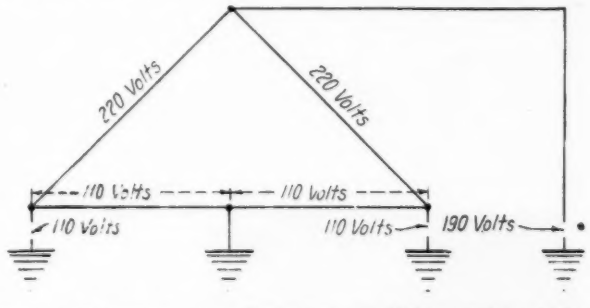
No. 453.—Series Street-Lighting Systems.—Recently I heard of a scheme for running series street lighting circuits without a constant-current regulator, but using a transformer of special type at each lamp post. What advantage, if any, does this latter system possess? Has it been tried out and, if so, with what results?—M. D. E., Denver, Colo.

Answer A.—The Pittsburgh Transformer Co., of Pittsburgh, Pa., employ a transformer with percentage taps on the primary and capacity taps on the secondary to transform from the standard distribution circuit to the series circuit. For current regulation a regulating coil is mounted in each lamp. This coil is connected in parallel with each lamp and operates on the principle of diverting current by means of balanced reactance. The advantages claimed are: No moving parts, no series film cutouts, no switchboard or tub regulator, high efficiency and high power-factor, and constant current at all loads. The manufacturers will undoubtedly furnish service performances and the names of localities where the system is in use.—W. H. K., Evanston, Ill.

No. 454.—Grounding Three-Phase, Four-Wire Distribution Systems.—In a city employing three-phase, four-wire distribution what is the best policy as regards the grounding of transformer neutrals for single-phase transformers and for transformer banks connected for power? We have encountered difficulties from grounding the middle point of a three-phase bank and the single-phase transformers of a different phase, the grounds being on the low-voltage side.—P. T. W., Minneapolis, Minn.

Answer A.—The usual practice of the largest companies operating three-phase, four-wire systems is to connect three-phase transformer banks with primaries in star and secondaries in delta, with the ground connection on the middle point of the secondary of one of the three transformers; this gives less than full line voltage from any line to ground. If the middle point is not accessible, one of the lines is connected to ground. In cases where the secondaries are connected in star the proper point to be grounded is, of course, the neutral connection of the secondaries. Single-phase lines are grounded on the neutral in the usual manner and so long as there is no electrical interconnection between the single and three-phase secondaries there should be no difficulty in grounding each separately. There is a possibility that the trouble to which P. T. W. refers may be due to the transformer connections; when transformers are connected star-delta and the system neutral is connected to the primary neutral of the transformers the least unbalance in primary voltage will cause a heavy current to circulate in the closed circuit of the secondary windings, often becoming sufficient to burn out the transformers or blow the primary fuses. This can be avoided by isolating the neutral of the transformer primaries from that of the system; then the neutral point will adjust itself to produce a balanced voltage in the secondary delta and there will be no interchange of current.—T. D. M., Chicago, Ill.

Answer B.—During an extensive experience in operating four-wire, three-phase distribution systems with grounded secondaries I find that the best practice is to ground one side of the secondary of a 110-volt transformer and to ground the middle point of a three-wire 110-220-volt transformer. A three-phase bank of transformers can be grounded in one place only, and that preferably the middle connection of one of the transformers. Secondary grounding is used not only for protection against lightning but to insure



No. 454.—Showing How Grounding of Middle Point of One Transformer Gives Lowest Voltage to Ground.

a customers' installation from having any current-carrying part build up a high voltage against ground. Consequently the grounding point should be so chosen as to make the voltage from any conductor to ground a minimum value. The accompanying sketch illustrates the point discussed. In order to eliminate circulating currents and to prevent accidental open-delta operation a three-phase, four-wire system should have the primary neutral grounded at the station only, and this neutral should not be connected in three-phase banks.—W. H. K., Evanston, Ill.

New Appliances

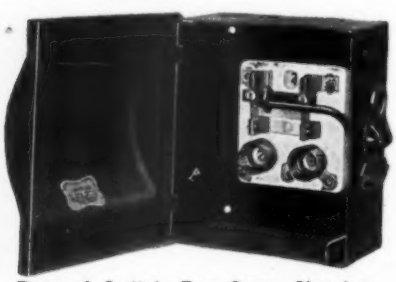
Ironclad Switch—Cleat Receptacles—Farm Lighting Plant —Compact Oil-Testing Cup—Fan Construction Development

New Square D Enclosed Switch Placed on Market.

Extremely low price is an outstanding feature of the new switch, known as No. 96211, just put on the market by the Square D Co., Detroit, Mich. An investigation carried on by the company disclosed the fact that there is an enormous market for a switch of this type. This fact has led to production of the switch in large quantities, reducing manufacturing costs and resulting in a low selling price. The new switch is shown in the accompanying illustrations.

New Square D Enclosed Switch No. 96211.

This new switch is a 30-ampere, 125-volt switch using Edison plug fuses. The current-carrying parts are enclosed in a cabinet made of No. 16 gauge steel. The switch is operated by a handle on the outside of the box, which is equipped with a hasp so that the cover may be locked, preventing access to live parts by any except authorized persons. A lock-off device permits locking the switch in the "off" position when this becomes necessary.



Door of Switch Box Open, Showing Interior.

Considering the increasing demand for building equipment at this time and the strong appeal of the new type of switch, the Square D Co. anticipates that present facilities for manufacturing it will soon be outgrown. The new switch bears the combined fire and accident label of the Underwriters' Laboratories.

New Bryant Candelabra Cleat Receptacles.

The device illustrated herewith, which is identified by catalog No. 612, is made with the regular spun copper screw shell and also with a shell of spring wire, which expands when the lamp base is threaded into it. The tension of this spring wire is more than sufficient to eliminate the possibility of the lamp becoming loosened from contact when subjected to great vibration and jar. The base of the block is molded composition of especially high grade and of the character that is approved by the United States Navy, amply strong to withstand the most severe service. This is a particularly desirable receptacle for use where it is necessary to illuminate instruments such as are used on board vessels, in the cabs of railroad locomotives, etc. These devices are approved by Underwriters' Laboratories and are made by the Bryant Electric Co., Bridgeport, Conn.

New Cleat Receptacles Without and With Spring Wire Locking Shell.

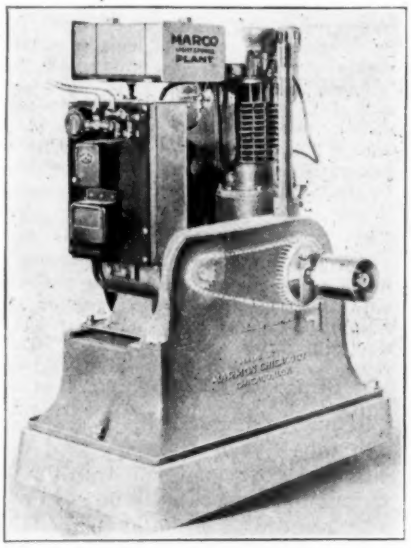
Chain-Drive Plant for Farm Lighting and Power.

The need for portable self-contained lighting sets by the army led to the development of a number of dependable types, one of which was the Marco chain-drive plant. It was tested and used in considerable quantities by the American Expeditionary Forces in France under the very severe conditions of active warfare. A plant of this type has now been placed on the market for use in connection with farm lighting and power.

This plant embodies a number of new features, one of which is that it is all mounted upon a single base. This makes for rigidity and makes the plant free from vibration and very compact. This compactness is secured by employing a chain drive between the engine and dynamo. The use of the chain-drive was adopted after its successful employment in automobile lighting outfits. Not only does it secure a compact set but eliminates the losses through belt slippage. The ratio of the driving and driven sprockets is such as to permit the engine to be run at the relatively low speed of 800 r.p.m. and the generator at the speed of 1800 r.p.m., which is a very suitable speed for dynamos.

A special control unit is provided to make the charging of the battery practically automatic and to secure the highly desirable method of giving the battery a tapering charge, that is, starting with heavy current and gradually diminishing as the charge proceeds. This method permits recharging of the battery in the shortest possible time and protects the battery from the injurious gassing due to heavy current flow toward the close of the charge. This control unit is mounted on a panel on the front of the plant, as can be seen in the accompanying illustration. This control also protects the generator from overload or overvoltage.

The engine is of the kerosene type and is mounted in such a way that it can be readily removed in about five minutes, mounted on any farming machinery and sent into the field to operate the binders, reapers, etc. The engine is rated 4 hp. and is of the air-cooled Marco type. The generator is rated at 1250 watts. A storage battery is provided as reserve and is made in two sizes, the first being suitable for 15 20-watt lamps, and the second for 100 20-watt lamps. In either case the same engine and dynamo are furnished.



Marco Self-Contained Plant for Farm Lighting and Power Service.

Because of the possibility of using this outfit either for operating the generator or by removal of the engine for direct mechanical drive of farm machinery, this plant is called the Marco dual-power plant. It is manufactured by the Marmon Chicago Co., Chicago, Ill.

Oil-Testing Cup for Testing Small Volumes of Insulating Oil.

Compact and Convenient Oil-Testing Cup.

The only known satisfactory method of determining the insulating value of oil is to measure its dielectric strength by means of a spark gap immersed in the oil. Various devices requiring a comparatively large sample of oil and a rather high voltage for their successful operation have been used for this purpose. Consequently there has existed a distinct demand for a device that would give reliable indications with a minimum volume of oil and with a relatively low testing voltage. A device for this purpose has been developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and is shown in the accompanying cuts.

This new design uses a molded construction, so that the cup proper is all in one piece and therefore is simple, rugged and compact. The second illustration shows this cup with electrodes removed and dismantled. The molded part contains two brass electrode bushings threaded to receive the packing gland. Back of each packing gland is a small amount of cotton packing, such as waste, which prevents oil leakage around the electrodes. The bearing surfaces are reamed to receive the electrodes; this, it is claimed, guarantees perfect fit and exact alinement. The electrodes are made from a cylinder 1 in. in diameter, threaded at one end to receive the locknut. Binding posts are placed on the outside end of the electrodes to attach the leads from the testing transformer. A steel feeler gauge for setting the gap at exactly 0.10 in. is attached to one of the binding posts, when not in use. The device has a cup-shaped interior to contain the oil sample to be tested, and the construction allows thorough cleaning without disturbing the gap setting. The feeler gauge is concealed within a hole in one electrode.

It is claimed that the whole testing cup is light, compact and very convenient. It weighs only 6½ lb. net, with dimensions of 8½ in. by 4 in. by 4¾ in., and requires only a 4-ounce sample of oil.

Westinghouse 12-in. Oscillating Fan.

Notable Advance in Design of Westinghouse Fans.

A notable advance has been made in the design of single-phase alternating-current induction motors for 12 and 16-in. fans. The new design gives a wider range of operating speeds than has hitherto been found possible even with a split-phase winding, which uses reactance and resistance coils to secure a modified form of polyphase current, and requires considerable energy in the resistance and reactance coils without corresponding gain in the efficiency of the motor.

This new design, which has been perfected by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., uses a current transformer in the base of the motor in place of a choke coil. The starting winding is energized by this transformer and is in circuit continuously, no centrifugal switch being used. The design of this transformer makes it possible to vary the speed of the motor within wide limits without sacrificing the starting voltage, and therefore the starting torque, a disadvantage found in most other types of single-phase motors. The primary of the transformer is in series with the main winding and the secondary in series with the starting winding. With this connection the motor receives two separate currents with large phase displacement between them, which gives the necessary torque for starting the motor and little loss when running at full speed. The motor, by using a series transformer instead of a choke coil, is receiving two currents out of phase with each other, and consequently operates as a polyphase motor of a two-phase type. Such a motor possesses a torque at any speed down to zero, consequently the fan load may be operated at any point desired.

The following shows a comparison of the performance of a 12-in. fan motor having series-transformer control and a similar one having choke-coil control:

Transformer Control.

Speed.	Watts.	Starting Volts.
High—1550 r.p.m.....	50	66
Medium—1300 r.p.m....	39.5	70
Low—1030 r.p.m.....	32	80

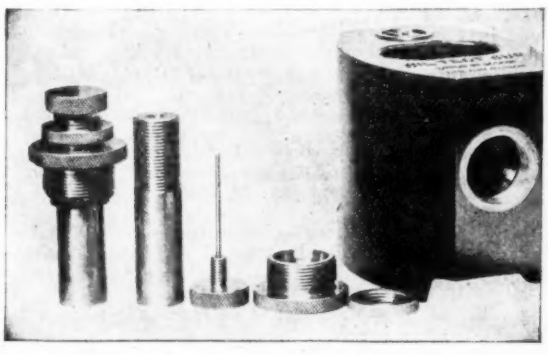
Speed change—520 r.p.m.

Choke Coil Control.

Speed.	Watts.	Starting Volts.
High—1645 r.p.m.....	45.5	56
Medium—1510 r.p.m....	40.0	80
Low—1415 r.p.m.....	39	90

Speed change—230 r.p.m.

The change renders the motor less liable to injury through lack of attention and careless handling. The power imput is slightly greater at high speed, but the utility is increased through the added advantage of a greater speed change and the impossibility of burning out the starting winding of the motor.



View of Westinghouse Oil-Testing Cup Disassembled, Showing the Parts.

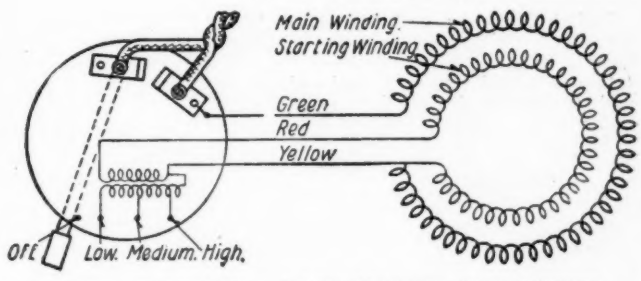


Diagram of Connections for Westinghouse New Induction Type Fan.

Latest Approved Fittings

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Cutout Bases, Cartridge Fuse.—Economy Fuse & Manufacturing Co., Chicago, Ill.

Cutout bases made in two types, having contact clips and terminals either formed separately and connected by usual means or formed in single piece.

"Economy," 0-600 amperes, 250 volts, Catalog Nos. 3325-32 inclusive, 3335-38 inclusive. 0-600 amperes, 600 volts, Catalog Nos. 5600, 5603, 5608-09, 5612-13.

Branch tap straps for use in converting above main line into branch cutout bases.

"Economy," 30 and 60 amperes, 250 volts, Catalog Nos. 3436-45 inclusive.

Listed Jan. 7, 1919.

Elevator Control Appliance.—The Cutler-Hammer Manufacturing Co., Milwaukee, Wis.

Elevator car switch. Drawing No. 14684.

Listed Dec. 20, 1918.

Fixtures for Use with Gas-Filled Lamps.—Panama Electric Lamp Co., 180 North Dearborn street, Chicago, Ill.

Listed Jan. 9, 1919.

Internal-Combustion Engine, Electric Plant.—Domestic Engineering Co., Dayton, Ohio.

"Delco Light." Non-automatic-starting internal-combustion engine, and direct-connected electric generator, control apparatus and storage batteries for small isolated stationary installations. Gasoline engine (standard stationary). Gasoline storage outside and underground. Electric control automatically stops engine when battery is fully charged. Rating: generator 3 kw., 32 and 120 volts.

Listed Dec. 4, 1918.

Plug-Fuse Casings. — Economy Fuse & Manufacturing Co., Chicago, Ill.

"Economy." Fuse casings for use in plug fuse cutout bases with standard cartridge enclosed fuses. 0-30 amperes, 125 volts, Catalog No. 2598; 31-60 amperes, 250 volts, Catalog No. 2599.

Listed Jan. 7, 1919.

Rosettes, Fuseless.—Bryant Electric Co., Bridgeport, Conn.

"Junior," Catalog No. 611.

Listed Jan. 22, 1919.

Switch Boxes.—Steel City Electric Co., 1207 Columbus avenue, Pittsburgh, Pa.

"Steel City." Sheet steel, single and gang-type boxes for mounting switches and plug receptacles.

Flexible tubing pattern, Catalog Nos. 756, 760, 810, 811, 815, 816.

Listed Sept. 3, 1918.

Switches, Automatic—Pressure-Operated Type.—United Pump & Power Co., Milwaukee, Wis.

Automatic switch consisting of copper contact switch operated by springs and levers actuated by pressure variation on diaphragm within chambers attached to switch base; designed to automatically control apparatus for maintaining desired air pressure.

Type K-1, a.c. Ratings, 12 amperes, 220 volts or less; 6 amperes, 440 or 550 volts.

Type K-2, d.c. Ratings, 6 amperes, 600 volts or less.

Type K-3, d.c. Ratings, 12 amperes, 220 volts or less.

Type L-1, a.c. Ratings, 12 amperes, 220 volts or less.

Type L-3, d.c. Ratings, 17 amperes, 220 volts or less; 11 amperes, 600 volts.

Type L-4, d.c. Ratings, 30 amperes, 220 volts or less.

Type L-5, d.c. Ratings, 38 amperes, 220 volts or less.

Type L-6, d.c. Ratings, 47 amperes, 220 volts or less.

Listed Jan. 21, 1919.

Switches, Automatic — Pressure-Operated Type.—United States Air Compressor Co., 6526 Carnegie avenue, Cleveland, Ohio.

Automatic switch consisting of copper contact switch operated by springs and levers actuated by pressure variation on diaphragm within chambers attached to switch base; designed to automatically control apparatus for maintaining desired air pressure. 1½ hp., 250 volts, Model H-2.

Note: This device is rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in its construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as acceptance of device for use in connection with automatic sprinkler or similar fire-protective equipments, for which services its merits have not been investigated.

Listed Oct. 21, 1918.

Switches, Enclosed.—The Cutler-Hammer Manufacturing Co., Milwaukee, Wis.

"C-H" with standard squirrel-cage motors; 110 volts, 3 hp.; 220 volts, 5 hp.; 440-550 volts, 5 hp.

With high-torque squirrel-cage motors; 110 volts, 4 hp.; 220 volts, 7½ hp.; 440-550 volts, 15 hp.

Listed Sept. 16, 1918.

Switches, Pendent. — The Arrow Electric Co., Hartford, Conn.

"Arrow E." Single-pole. Push. Catalog Nos. EM-801 to EM-817 inclusive, EN-801 to EN-817 inclusive, 6670-82 inclusive.

Listed Oct. 24, 1918.

Switches, Surface. — The Bryant Electric Co., Bridgeport, Conn.

Ceiling switches—adaptations of standard "Bryant" or "Perkins," pull-socket mechanisms.

"New Wrinkle" base, Catalog No. BZ, mounting rings, Catalog Nos. 304-05.

Listed Oct. 10, 1918.

Switches, Surface.—The Hart & Hegeman Manufacturing Co., 342 Capitol avenue, Hartford, Conn.

"H. & H." Single-pole. Catalog Nos. 3774-75.

Three-way, Catalog No. 53.

Listed Nov. 14, 1918.

Wire—Portable Flexible Cord for Electric Heaters.—Canada Wire & Cable Co., 2410 Dundas street West, Toronto, Ont., Can.

Marking: Red and black thread cabled with copper strands.

Tag on coil to read: "National Electrical Code Standard."

Listed Dec. 17, 1918.

Wire—Portable Flexible Cord for Electric Heaters.—Rome Wire Co., Rome, N. Y.

Marking: Yellow and green thread together and laid parallel with conductor between rubber insulation and braid.

Listed Dec. 24, 1918.

Wire, Rubber-Covered.—The Whitney Blake Co., 1185 Dixwell street, New Haven, Conn.

Marking: One uncolored thread running parallel between insulation and braid.

Listed Dec. 31, 1918.

Wire, Rubber-Covered Fixture.—National Metal Molding Co., Fulton building, Pittsburgh, Pa.

Marking: One black and one yellow thread in braid.

Listed Jan. 10, 1919.

Wire—Slow-Burning. — Eugene F. Phillips Electrical Works, Ltd., De Gaspe and Marmier streets, Montreal, Can.

Marking: One green thread in outer braid.

Tag on coil to read: "National Electrical Code Standard."

Listed Jan. 10, 1919.

Wires — Slow-Burning Weatherproof.—Eugene F. Phillips Electrical Works, Ltd., De Gaspe and Marmier streets, Montreal, Can.

Marking: One green thread in outer braid.

Tag on coil to read: "National Electrical Code Standard."

Listed Jan. 10, 1919.

Trade Activities

Capital Electric Co. Holds Sales Convention — Beckwith Machinery Opens Cleveland Office — Special Literature

Penn Storage Battery Co., Pittsburgh, Pa., has completed negotiations for leasing of the building at 5950-54 Baum boulevard for a new service station. The structure will be equipped to provide departments for the adjustment and repair of batteries, with the entire second floor equipped with the latest electrical machinery for testing, etc., and the installation of a complete starting and lighting plant.

Walter N. Polakov & Co., Inc., 31 Nassau street, New York City, has entered the engineering field as consultant in power production, methods, industrial investigations, labor problems, scientific record systems and production accounting. Walter N. Polakov, a prominent consulting engineer, heads the new company. Associated with him on the staff of the new organization are a number of capable engineers.

Roseberry-Henry Electric Co., Grand Rapids, Mich., for many years in the retail electrical business, has established a wholesale department, and will cover the western Michigan territory. The company carries the following well known lines of electrical equipment: General Electric, Westinghouse, Trumbull safety switches, Simplex wires and cables, and others. It specializes in industrial lighting, having recently equipped the Wolverine Brass Co. and the Luce Furniture Co. additions. The repair department will continue as formerly, giving service in any part of the state.

Capital Electric Co., Salt Lake City, Utah, recently held a very enthusiastic three-day sales convention, attended by managers, heads of departments, salesmen and others connected with the electrical industry. The meetings, which took place in the salesrooms of the company, were punctuated with stirring and vitalizing remarks by various department heads and all the phases of the electrical appliance industry and the manufacturing and selling of automobile accessories were discussed with a view of creating a broader understanding of the purposes and possibilities of the Capital Electric Co's. operations and the better understanding by all concerned of the business in general. Several manufacturers of electrical appliances and automobile supplies sent members of their organizations or special representatives to attend the meeting and some very instructive addresses were made. The Capital Electric Co. was organized by R. W. Nichol about ten years ago and its phenomenal success during this time is to be attributed to the institutional and efficiency creating methods as exemplied by Mr. Nichol in this annual sales meeting of the company.

Charles Polacheck & Brother Co., Milwaukee, Wis., has issued an eight-page supplement No. 26, illustrating some advance designs from its new general catalog No. 27, which will be ready for distribution in the Spring. The company also announces the organization of a department of chandelier parts and supplies and expects to issue catalogs covering this material.

Maynard Electric Steel Casting Co., Milwaukee, Wis., recently installed a three-ton Moore electric furnace, in addition to the Rennerfeldt furnace in its new foundry building and other new equipment, including an electrict crane. The capacity of the plant is about 500 to 600 tons of steel castings per month. The Maynard company was organized in 1912, operating at that time only a ¾-ton Rennerfeldt electric furnace and transacting business in very modest quarters. In 1917 the company underwent a change in organization, the controlling interest having been acquired by Sylvester J. Wabiszewski and conducted under the management of Frank Wabiszewski, and since that time has greatly increased its facilities and witnessed a steady increase in business.

Vaughn & Meyer, Milwaukee and Wausau, Wis., and **Charles L. Pillsbury Co.,** Minneapolis and St. Paul. Minn., have issued a well illustrated brochure entitled "Engineering the Universal Factor." This unique publication sets forth the possibilities of effective co-operative engineering services as they may be rendered through the co-operation of consulting engineering firms and particularly by the two firms mentioned. A brief history of the two organizations is given and organization charts are shown that give a good idea of the wide range of activities for which this joint organization is ready to undertake engineering service. Among the branches of engineering mentioned are the following: Industrial, civil, mechanical, hydraulic, electrical, heating and ventilating, refrigerating, sanitary illuminating, safety, inspection, commercial, utility, engineering appraisals, commercial testing, expert testimony, etc. A large number of illustrations are shown of some of the projects on which the two firms have been engaged. Through other co-operative arrangements the appraisal work and commercial testing of the joint organization are carried out. One of the ideas set forth in the brochure is to show that a large organization such as this can co-ordinate the numerous factors which enter into the preliminary study, design, execution and operation of large engineering projects. This engineering organization has adopted a new symbolic emblem which will be used to identify its work.

White Bros. have opened a new electrical contracting business and salesroom for electrical fixtures at Urbana, Ill. H. C. White, one of the members of the firm, was formerly a salesman for the Western Electric Co., of Chicago.

A. F. Daum, manufacturer of refillable fuses for electric light and power, Pittsburgh, Pa., is sending out a circular listing a number of Daum fuses, including Type "B," Type "E" or knife blade, street car, midget and auto fuses. The Daum fuse is claimed to be the original renewable fuse, designed to provide utmost safety, affording all the advantages of the old style cartridge fuse, with the addition of economy and convenience in refilling.

Beckwith Machinery Co., Pittsburgh, Pa., has opened an office and warehouse in Cleveland at 1227 West Ninth street, to serve Ohio and the surrounding territory more efficiently. The new branch will carry a complete stock of mine, mill and construction equipment, including hoisting engines, electric hoists, derricks and derrick fittings, engines and boilers, etc. E. G. Stoner, who will be in charge of the Cleveland office, was formerly in the Pittsburgh office. He has been identified with the company of which J. S. Beckwith is president and latterly was its sales engineer. Mr. Stoner will be assisted by C. Z. Dally, who formerly had charge of city sales in Pittsburgh.

Crescent Belt Fastener Co., 381 Fourth avenue, New York, has just issued a new bulletin covering "The Crescent Principle of Belt Joining," which summarizes in short, compact phrases the reasons why many of the largest industrial plants in the country are standardizing Crescent belt fasteners throughout. This bulletin also contains a ready-reference service chart by means of which a superintendent, a belt man or machinist can instantly determine the correct type of belt fastener to use for any condition of work. One of the most important lessons learned from the war is that industrial man power must be conserved and workers continually kept productive: and all hazards which would even temporarily impede the efficiency of the worker must be eliminated. The delays, production losses and the high cost of stoppage caused by breaking belt joints, let alone the inconvenience and difficulty of repair and the damage to the belt, are a serious problem in industrial plants and it is here that the Crescent belt fastener has stepped in and done much to alleviate the situation. Copies of this bulletin and service chart may be obtained by writing to the Crescent Belt Fastener Co., service department.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Boston, Mass.—The United States Government, First Naval District, has made announcement that plans are under way for the establishment of a chain of radio stations, approximately 30 miles apart, along the Atlantic coast.

Fitchburg, Mass.—Fitchburg Gas & Electric Light Co. has recently placed into effect increased rates for service.

Marlboro, Mass.—Marlboro Electric Light Co. is understood to be planning for improvements in its local plant to facilitate operations and provide increased service to the municipality.

Winchendon, Mass.—The Board of Education is said to be considering plans for the installation of a new heating system in the Tucker school building.

Brooklyn, N. Y.—Plans are understood to be under consideration by the Bedford Board of Trade for extensive improvements in the electric street-lighting systems in Nostrand avenue and Fulton street, in the Bedford section.

Buffalo, N. Y.—Ross Heater & Manufacturing Co., Forrest avenue, manufacturer of heating equipment, etc., is considering plans for the construction of a one-story addition to its plant, brick and steel, about 50x75 ft., at Forrest and West avenues.

Buffalo, N. Y.—Buffalo General Electric Co. has recently made announcement, using space in the local dailies, etc., that following the removal of all restrictions on the use of electric energy, power for factory, stores, homes, etc., is available in unlimited quantities.

Creedmoor, L. I., N. Y.—In connection with plans now being completed for the erection of a group of hospital buildings by the State Hospital Commission, to be located at Creedmoor, half way between Jamaica and Garden City, considerable new electrical equipment will be required. The new institution will be affiliated with the Brooklyn Hospital for the Insane.

Kingston, N. Y.—Hudson Power Corporation, affiliated with the Kingston Gas & Electric Co., East Strand street, is understood to be arranging plans for the construction of a large power plant on the Walkill river in the vicinity of New Rifton, N. Y. The J. G. White Engineering Corporation, 43 Exchange place, New York, is engineer for the company.

Mohawk, N. Y.—W. W. Wotherspoon, Superintendent of Public Works, Albany, is arranging plans for the construction of hydraulic power plants along the barge canal (barge canal contract No. 176). Frank M. Williams, Telephone building, Albany, is state engineer and surveyor.

Niagara Falls, N. Y.—Union Carbide Co. plans the erection of an electric switching station estimated to cost $45,000.

Salamanca, N. Y.—The city has completed plans for the installation of an engine of 350 hp. capacity in the municipal lighting plant on Water street. It is expected that the new unit will be ready for operation early in March.

Sangerfield, N. Y.—The Public Service Commission has granted approval to the application of the Waterville Gas & Electric Co., Waterville, for permission to construct and operate an electric lighting system from Waterville to the town of Sangerfield. The company has been granted a franchise by the town council.

Thiells, N. Y.—Until March 4 the Board of Managers of Letchworth village, Thiells, located at 7 Wall street, New York, will receive bids for the installation of a new central heating plant at the local site. Frank A. Vanderlip is president of the board. It is understood that the board is now arranging plans to call for bids at an early date for the erection of a large new addition to the power plant and the installation of a quantity of new power house equipment, the entire work being estimated to cost approximately $300,000. Lewis F. Pilcher, State Architect, Capitol building, Albany.

West Haverstraw, N. Y.—The board of managers of the New York State Hospital for the care of Crippled and Deformed Children is arranging plans for the installation of an electric-lighting system for the grounds at the institution. Request for an appropriation of $2000 to provide for the work has been made.

Bordentown, N. J.—The city commission has adopted the budget arranged for the maintenance of municipal operations for 1919. Included in the appropriations is the sum of $3690, to provide for the operation of the electric street-lighting system during this period.

Jersey City, N. J.—Pennsylvania Railroad recently awarded a contract to the W. W. Farrier Co., 44 Montgomery street, for improvements in the power plant at its local properties, including the recovering of the power and heating lines.

Newark, N. J.—The Public Service Corporation has filed with the Secretary of State an amended certificate of incorporation providing an increase in its authorized capital stock. The state's fee for the filing of the certificate was $10,020. The capital stock has been increased from $50,000,000 to $100,000,000.

Newark, N. J.—The city has disposed of bond issues for $500,000 and $300,000 for the development of the watersheds at Wanaque and Pequannock, respectively. In connection with the proposed work, large quantities of electrical equipment will be required.

Paterson, N. J.—Fire on Feb. 10, originating in the plant of the Comet Light Co., 23 Main street, caused a damage estimated to total $30,000. The damage to the plant of the Comet company totaled $10,000.

Trenton, N. J.—Journeymen electricians and helpers engaged in the Trenton section have been on strike for an increase in wages to 87½ cents per hour. It is understood that at a conference of electrical contractors a proposal was made to pay a price of 75 cents per hour, which was refused by the strikers.

Allentown, Pa.—In connection with the proposed construction of a new municipal lighting plant at the pumping station, to utilize excess boiler capacity now available, the city commission has retained Frank Koester, 50 Church street, New York, consulting engineer, to investigate as to the advisability of adhering to this plan.

Meadville, Pa.—Meadville Malleable Iron Co. has awarded a contract to the Harper Building & Lumber Co. for the construction of a new one-story power plant at its works, about 45x50 feet. The structure is estimated to cost $10,000.

Oil City, Pa.—Plans are under consideration by the city for the construction of a one-story boiler plant addition to be used for municipal purposes, estimated to cost $45,000. B. B. Weber is engineer.

Philadelphia, Pa.—Philadelphia Co. has arranged for the issuance of three-year 6% gold notes for $10,000,000. It is understood that a portion of the proceeds will be used for proposed expansion.

Philadelphia, Pa.—J. Kyle Dudley has filed plans for the construction of a one-story boiler plant and engine room addition at Frankford avenue and Worrell street.

Philadelphia, Pa.—Department of Wharves and Docks has awarded a contract to M. H. McCloskey, Jr., 1620 Thompson street, for the construction of a new pumping station, tank house and water tower. (Specifications 3682) to cost $15,567.

Philadelphia, Pa.—Bureau of Yards and Docks, Navy Department, is having plans prepared for the construction of a one-story brick substation (Specification 3798) at Piers A and B at the League Island Navy Yards.

Pittsburgh, Pa.—The city engineers are preparing plans for the construction of the proposed subway system which will be about one and one-half miles in length, and is estimated to cost a total of about $6,000,000.

Sayre, Pa.—Sayre Electric Co. is making rapid progress on the installation of new boiler equipment at its plant, and it is proposed to inaugurate operations at an early date.

Torrance, Pa.—The Board of Trustees of the Western State Hospital for the Insane is arranging plans for the construction of a hospital group, to include a large power plant, mechanical laundry and auxiliary structures. The entire work is estimated to cost $2,000,000. Samuel S. Richard, Altoona, is chairman of the board.

Villa Nova, Pa.—Philadelphia & Western Railway Co., Upper Darby, is making rapid progress in the construction of two electric substations located at Villa Nova and Beechwood. The structures are estimated to cost $20,000 each. H. P. Friend, Boyer Arcade, Norristown, is the contractor.

Newcastle, Del.—It is reported that plans are under consideration by the city for the floating of a bond issue for $150,000 to be used for light and water purposes.

Beckley, W. Va.—Virginia Railway Co. has awarded a contract for the construction of a new local power plant, designed to furnish electric energy from Elmore to Clarks Gap.

Fulton, W. Va.—West Virginia Traction Co. is making rapid progress in improvements at its local pumping station, following serious breakage. It is understood that operations will be inaugurated in about two weeks.

Spartanburg, S. C.—The city has completed plans for the installation of a new "white way" type street-lighting system on South Liberty, North Church, Main and other streets. John F. Floyd is mayor.

Spartanburg, S. C.—Manufacturers Power Co. has recently completed the construction of a transmission system from its hydroelectric plant on the Green river, near Hendersonville, to Spartanburg.

Savannah, Ga.—The plan of installing two additional electric pumps in the water system is being considered by the water committee of the city council. A conference of the committee was held and the advantages of such an addition to the system were discussed and types of pumps with their cost were studied. If the pumps are purchased it is proposed to have them installed in the east side section and in the Chatham Crescent section.

Blountstown, Fla.—The city contemplates bond issue for improvements, including electric light and waterworks system. Address W. P. Fields, city attorney.

NORTH CENTRAL STATES.

Cleveland, Ohio.—Electrical Manufacturing Co., 112 Hamilton avenue, recently acquired the old plant of the Richard Auto Manufacturing Co. and will remodel the plant for its own use.

DATES AHEAD.

Minnesota Electrical Association. Annual convention, St. Paul, March 18-20. Secretary-treasurer, F. C. Hoffman, St. Paul, Minn.

Society of Industrial Engineers. National conference, New York City, March 18-21. Secretary, Irving A. Berndt, 327 South La Salle street, Chicago, Ill.

Wisconsin State Association of Electrical Contractors and Dealers. Annual convention, Hotel Pfister, Milwaukee, Wis., March 24-28. State secretary, John A. Piepkorn, 108 Sycamore street, Milwaukee, Wis.

Wisconsin Electrical Association. Annual meeting, Milwaukee, March 27-27. Secretary, J. P. Pulliam, 1408 First National Bank building, Milwaukee.

Tri-State Water and Light Association. Annual meeting, Greenwood, S. C., April. Secretary-treasurer, W. F. Steiglitz, Columbus, S. C.

National Fire Protection Association. Annual meeting, Ottawa, Ont., May 6-8. Secretary-treasurer, Franklin H. Wentworth, 87 Milk street, Boston, Mass.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

Milford, Ohio.—The Rock county board of supervisors have under advisement the erection of a hydroelectric power plant, 104x116 ft. in size.

Ft. Wayne, Ind.—The city is arranging plans for the construction of a new dam across the St. Joe river, and the erection of a filtration and purifying plant for the waterworks, the entire project being estimated to cost $500,000. It is understood that bonds for this amount will be issued.

Gary, Ind.—The manufacture of the O. K. Giant battery by the O. K. Giant Battery Co., recently organized is looked upon as an important new business in Gary. It is planned to manufacture a standard dry cell of superior quality which will sell at retail at one dollar. It is said that plans are being drawn for a 100x200 ft., two-story brick building to cost $50,000.

Loogootee, Ind.—This city has purchased the electric lighting plant, the consideration being $7,000. It was formerly owned by business men of Petersburg, Ind. The plant was moved from Petersburg to Loogootee when the 24-hour current at Petersburg was placed in service.

Moran, Ind.—Electric light and power service will be given Moran by a new company just incorporated for $25,000 by Nicholas E. White, John C. Weida and J. White. The company will build a plant and extend service over the town.

Seymour, Ind.—The Indiana Public Service Commission has notified Harry Findley, city clerk, that the petition filed by the Interstate Public Service Co., asking for a surcharge on electric rates, has been dismissed at the request of the petitioners. The company had asked for the right to make an additional charge of 25% on electric current used for lighting purposes and a 50% increase in power service.

Shelbyville, Ind.—The Shelby County Board of Commissioners has taken bids for the erection of a new power plant at the Shelby County Hospital, in connection with other proposed work, to include electric wiring and the installation of a new heating system. The low bid was submitted by the Sanborn Electric Co., Indianapolis.

Shelbyville, Ind.—A company is being formed to utilize the water power at St. Paul, Ind., to generate electricity. This follows an investigation made some years ago by Purdue University, which found that the narrow channel of Flat Rock river at St. Paul was suggestive of water power development. The engineers advised the construction of a concrete dam 280 ft. long across the top and 35 ft. high.

South Bend, Ind.—Bingham Electric Co., dealing in electrical supplies, is a new business house in South Bend. It has been incorporated under state law by George M. Platner, Ralph Bingham and C. E. Rogers.

Bushnell, Ill.—North McDonough Light & Power Co. has received permission from the Illinois Public Utilities Commission for the construction and operation of an 11,000-volt, single-phase, electric transmission line from Blandinsville to Good Hope; for the construction and operation of a distribution system in the village of Good Hope; and for the selling of electrical service in the village of Good Hope and between Good Hope and Blandinsville. The company is also authorized to issue $10,000 of its capital stock, consisting of 100 shares at a par value of $100 each. The company was also permitted to engage in a contract with the Western Illinois Utilities Co. for the purchase and sale of electrical energy.

Cairo, Ill.—Cairo Railway & Light Co. has ordered a 2000-kw. turbine generator from the General Electric Co.

Chicago, Ill.—North Shore Electric Co. will purchase the Milwaukee Sheboygan line and will make improvements and extensions. Address General Manager M. C. Klaus, 1424 North Clark street.

Chicago, Ill.—The Illinois Public Utilities Commission has granted the Commonwealth Edison Co. authority to enter into an electric conversion service at various substations in the city of Chicago.

Jacksonville, Ill.—Jacksonville Railway & Light Co. has been authorized to issue $123,000 of preferred capital stock by the Illinois Public Utilities Commission.

Hillsdale, Ill.—Hillsdale, Silvis and other communities will be supplied with electric light and power by the Rock River Valley Light & Power Co., of Hillsdale. An electric light plant will be installed at Hillsdale. As there are 150 subscribers to the capital stock of $20,000, it is evident

that a large number of people wish the service. Those incorporating the company are Clarence Britzer, Frank Wake and Fred Frels.

Kankakee, Ill.—Illinois Light & Power Co. is having surveys made for constructing power dam near the Palisa dam. General office, 105 South LaSalle street, Chicago.

Kewanee, Ill.—The Illinois Public Utilities Commission has continued until July 31, 1919, temporary rates made effective as of Feb. 1, 1918, charged by the Consolidated Light & Power Co. in Kewanee, Ill., and Galva, Ill.

Hastings, Mich.—A delegation of Hastings men are investigating municipal lighting conditions. They claim Hastings is tired of buying its current from outside concerns, and is contemplating putting in a municipal plant and generating its own current. Address city clerk.

Saugatuck, Mich.—At the Saugatuck council meeting there was an informal discussion of the proposition to municipalize the electric light plant.

Sunfield, Mich.—The committee appointed to secure information on the proposition of electric lights has been informed by the Commonwealth Power Co. that it will run a line to Sunfield providing the villagers will buy enough of the company's stock to pay for constructing the line. It is estimated that the cost would be around $35,000. The company would offer all preferred stock bearing interest at 6%. The Thornapple Power & Light Co. states that it has not enough power to undertake to supply Sunfield with lights.

Milwaukee, Wis.—The finance committee approved of a $300,000 municipal lighting plant bond issue. Address city electrician.

Hibbing, Minn.—Architects Holstead & Sullivan, 410 Palladio building, Duluth, have completed plans for a municipal power plant. Address Charles Foster, General Superintenddent of Water and Light Department, Hibbing.

St. Paul, Minn.—Western Display Co.'s factory at 300 Chestnut street, has been damaged by fire. Loss $20,000. T. R. Willwerscheid, president of the company.

Clinton, Iowa.—Clinton Gas & Electric Co. has made a proposal to the city council of Clinton for furnishing an all-night lighting service of 303 modern flaming arc lamps at a rental of $55 per lamp per month in place of the old contract which calls for only 283 street lamps at a rental of $60 per lamp per month.

Cumberland, Iowa.—J. V. White will make extensive improvements to electric light plant; also planning to build transmission lines to Bridgewater and Massena.

Dubuque, Iowa.—Action on a proposed municipal electric lighting plant for Dubuque is before the city council. An expenditure of $250,000 is considered necessary if the plant is placed in operation.

Iowa City, Iowa.—The city will establish a municipal gas and electric light plant. Contract of the Iowa City Light & Power Co. expires June, 1919. W. H. Bailey is interested.

Monticello, Iowa. — Monticello Electric Light Co. is planning to extend its lines throughout the territory adjoining Monticello. Representatives of the company attended a meeting of the stockholders of the Sand Spring Creamery Co. and discussed the extension of lines to Sand Spring so that the creamery might be furnished and equipped with electric power to operate the creamery and make its own artificial ice.

Sioux City, Iowa.—Sioux City Gas & Electric Co. will expend about $8000 for improvements in its plant. A new switchboard section of the engine room will be built to consist of a two-story tower room for the switchboard. The first floor will accommodate the low extension boards, the high tension voltage to be installed on the second floor.

Cabool, Mo.—$10,000 in bonds have been issued to purchase electric plant owned by John Bauck.

Independence, Mo.—The city council of Independence has fixed a new schedule of rates for electric power which are five, four and three cents per kw., according to the amount used. The former low rate of two cents per kw. made to large consumers have been rescinded.

Macon, Mo.—$30,000 in bonds has been sold for improving and enlarging the water and electric light plant.

Marshall, Mo.—Henrici, Kent & Lowry, Kansas City engineers, have submitted plans and estimates for a new municipal light plant and a system of street lighting. The entire cost will probably be about $100,000, which includes the cost of construction of plant, purchase and installation of machinery, primary circuit, poles, wiring, meters, street lights and "white way" system. Bids will be asked for construction work and equipment in the near future.

Memphis, Mo.—At a meeting of the board of directors of the Memphis Electric Light, Heat & Power Co., E. Brainerd was elected president. It was decided to put in an ice plant in connection with the light plant to insure 24-hour service.

St. Joseph, Mo.—The City Council has authorized the city attorney to prepare an ordinance calling for an election on a bond issue for the improvement of the municipal lighting plant. The present lighting plant is for an arc lighting system only and the current used is different than that used for incandescent lighting. It will require considerable additional machinery to install the new system. A municipal fuel and ice plant will not be considered at the present time. C. D. Fox, superintendent.

Baxter Springs, Kans.—E. S. McCombs is making preparations for the installation of a new electric lighting plant. Work on the plant will start in the near future.

Lewis, Kans.—The towns of Lewis and Sylvia are contemplating the installation of a new lighting plant.

Topeka, Kans.—The upper house of the state legislature has approved the following appropriation measure for the Topeka State Hospital: $12,500 for stokers for power plant, $10,000 for overhauling water, steam heating and electric lines.

Topeka, Kans.—But slight opposition has developed in the Kansas house of representatives to the bill which authorized Kansas City, Kans., to buy and operate its own street car system. The bill, which is modeled closely after the law giving the city the right to own and operate its water and light departments, has been approved in committee of the whole house and cannot be amended when it comes up to a final vote.

Wichita, Kans.—A "white way" lighting system on First street, from Main to Lawrence, is contemplated.

SOUTH CENTRAL STATES.

Louisville, Ky.—Commercial department of the Louisville Gas & Electric Co. during the week ended Feb. 7 secured 59 new electric light and power customers with 27 kw. of lighting and 161 hp. in motors, and closed contracts for wiring 21 already built houses. New business connected to the company's lines includes 32 customers with 13 kw. of lighting. There was a temporary loss of 37 hp. in motors. Output of electrical energy shows an increase of 23% over the corresponding week last year.

Louisville, Ky.—Tuck & Co., 1113 W Main street, will install considerable power plant equipment.

Memphis, Tenn.—Fire damaged the boiler plant at the works of the Memphis Gas & Electric Co. recently.

Chattanooga, Tenn.—Chattanooga Electric Metals Co. is planning to operate its plant to capacity for the production of high grade ferro silicon. Power for operation will be supplied by the Tennessee River Co.

Huntsville, Ala.—Huntsville Farm Lighting Co. has been organized with W. L. Eustace as manager. This new concern has taken over the Delco Lighting Agency in this territory and will make a specialty of serving the farmers and others in need of a good serviceable light and power service at the least possible cost.

McAlester, Okla.—The $250,000 bond issue for a new high school has been approved by the voters of the city. With the addition of $100,000 insurance money there will be $350,000 available for the new building.

Norman, Okla.—Election to vote $75,000 bonds for the purchase of a municipal light plant will be called in the near future. It is planned either to purchase the plant of the Oklahoma Gas & Electric Co. of Oklahoma City or to establish a new plant.

Matagorda, Tex.—Texas Gulf Sulphur Co. has let the contract to J. G. White & Co. of Dallas for the building of a model town at its sulphur mines near here. Modern electric light and power systems will be installed. The proposed town will be of sufficient size to accommodate 1500 families. It will be called Welfare Settlement.

Fort Worth, Tex.—Texas Gulf Refining & Pipe Line Co. has purchased a site of 135 acres of land four miles south of Wichita Falls upon which it

will build a model town to be called Oildom. Modern public utility plants will be installed. It will also construct a large oil refinery upon the land.

Cisco, Tex.—Cisco Gas & Electric Co. will make improvements to its electric light and power plant at a cost of about $50,000.

San Angelo, Tex.—It is recommended by a citizens' committee in a report to the municipal commission that the electric light and waterworks plants at the San Angelo Water, Light & Power Co. be purchased by the city. These plants are estimated to have a value of $350,000. If the contemplated transaction is accomplished important improvements will be made to the properties, it is stated.

Wichita Falls, Tex.—Wichita Falls Electric Co. will enlarge its electric power plant for the purpose of providing electrical energy for operating the pumps and well drilling machinery in the Burkburnett oil field.

WESTERN STATES.

Cutbank, Mont.—Work on the construction of a light and power plant for Cutbank will be under way by March 1 if the council takes favorable action upon the matter. The plant will be installed by Joseph Seal & Son. Address Mayor S. L. Potter.

Kalispell, Mont.—The city council of Kalispell has granted a new contract for electric street lighting to the Mountain States Power Co. It is to run for 35 months and for each cluster of four 60-watt lamps. The Great Northern Railroad will be requested by the Board of Aldermen to install new lights around its depot and at its street crossings. Several new lighting districts will perhaps be created in the city within a short time. Kalispell, already well lighted, plans to become the best lighted city in the state.

Pilot Rock, Wash.—The city has secured a plot of ground for the erection of a light plant. Address city clerk.

Seattle, Wash.—City Engineer Dimock estimates that the Skagit River power plant will cost not less than $30,000,000 when fully developed. The sum of $80,000 has already been spent in sinking test holes, etc.

Spokane, Wash.—Washington Water Power Co. has purchased the plant and all property of the Spokane Light, Heat & Power Co. of that city at $1,500,000. The latter concern, which was in the hands of a receiver, operated a central heating plant.

Astoria, Ore.—Resolution passed the Port of Astoria Commission requesting the Pacific Power & Light Co. to provide relief at once to the industries appearing for electric energy without a surplus adequate to take care of whatever offers during the present. Commission states it will start a system of its own if demands are not met.

Marshfield, Ore.—The Bay Mill has installed a new shingle mill which will be operated electrically with current furnished by the Mountain States Power Co.

Sacramento, Cal.—It is said that a strike may be called by western electricians if the wages of workmen are not increased from $4.75 to $6.40 a day. This statement has been given out by R. A. Swain, president of the Pacific district council of the International Brotherhood of Electrical Workers.

Sacramento, Cal.—In connection with the construction of the proposed new plant of the Northern California Milk Producers' Association, contract for which has been awarded to the Clinton Construction Co., San Francisco, a large power plant for operation will be erected. The entire project is estimated to cost $125,000.

San Diego, Cal.—Plans have been prepared by the Government for the installation of a new flood lighting system at the naval coaling station at La Playa. It is understood that the system will consist of high-powered projectors with wires running to the lights from the local power plant in submerged concrete conduits.

San Diego, Cal.—San Diego Electric Railway Co. is making rapid progress in the construction of a new extension to its traction system to the local shipbuilding plant. The project will cost in the neighborhood of $50,000.

San Pedro, Cal.—Plans have been prepared by the Edison Co. for extensions in its system in Los Angeles harbor, to provide for increased operations.

NEW PUBLICATIONS

Notes on Lignite, Its Characteristics and Utilization.—The Bureau of Mines, Department of the Interior, has prepared Technical Paper 178, which has for its subject, "Lignite—Its Characteristics and Utilization," prepared by S. M. Darling. This paper contains a short summary of present information on the composition and utilization of lignite and is issued by the Bureau for the purpose of outlining problems that are of immediate and vital importance to the maintenance of urgent activity. The bulletin contains much valuable information for users of lignite and takes up in consecutive order the classification of coals; characteristics of lignite; fuel needs of lignite areas; wastes in present methods of burning coal; efficient utilization of lignite; by-products from lignite, including gas, ammonia, oils and tars; possible conservation of petroleum and natural gas, and advantages in carbonizing lignite, etc.

Central Station Heating.—The Bureau of Mines, Department of the Interior, is distributing Technical Paper 191 entitled, "Central Station Heating—Its Economic Features with Reference to Community Service" by John C. White. This 23-page bulletin is very interesting and of considerable value to the power plant engineer. It is another contribution to the literature on the conservation of fuel through more efficient utilization in power and heating plants, and discusses some of the possible economies that may be effected through the wider use of central heating stations, and gives data on costs and results obtained with such plants for comparison with other types. It is profusely illustrated with charts of feed-water records, showing the effect of changing from simple non-condensing to compound condensing engines and the effects of running ventilating equipment, also curves of power-load and others showing the relation of fuel burned to temperatures. The price of the publication is 5 cents and may be obtained by addressing the Superintendent of Documents, Government Printing Office, Washington, D. C.

PROPOSALS

Boilers, Turbines, Meters.—L. F. Pilcher, State Architect, Albany, N. Y., will receive bids March 4 for building an additional power house at Thiell, N. Y., installing equipment and underground piping system, including new boilers, piping, feed water heaters, filters, meters, feed pump steam turbines, valves, etc.

Electric Light System.—Sealed proposals will be received by the city of Chicago, Feb. 28 at Room 406 City Hall, for decorative concrete work and electric light system on the approaches of the Lawrence avenue bridge, according to plans and specifications on file in the office of the Department of Public Works of said city, Room 406 City Hall. Address Charles R. Francis, Commissioner of Public Works.

Feed-Water Pumps.—Bids for furnishing turbo-centrifugal feed-water pumps will be received at the office of the Director of Public Service, Delaware building, Akron, Ohio, until 12 o'clock noon, Feb. 28. The contract includes the furnishing of two horizontal steam turbine driven, direct connected, centrifugal boiler feed-water pumps, with a normal capacity of 65 to 75 g. p. m. against a total head of 462 ft. All proposals must be made on the blank forms furnished by the city; each proposal must be accompanied by a certified check on some solvent bank in the amount of $200. Address H. S. Morse, director of Public Service.

INCORPORATIONS

Philadelphia, Pa.—Automotive Battery & Electric Co. Capital, $50,000. To manufacture electric batteries and other electrical specialties. Incorporators: M. M. Clancy, C. L. Rimlinger, and P. B. Drew, Wilmington, Del.

Wilmington, Del.—Battery Service Corporation. Capital, $100,000. To manufacture batteries, etc. Incorporators: G. S. Biddison, J. H. Weaver, and M. M. Lucey, Wilmington.

Personal

B. E. Parker Joins Northern Ohio Traction & Light—Paul Campbell Becomes Factory Manager of Philadelphia Co.

ALFRED HERZ, of the general office staff of the Public Service Co. of Northern Illinois, has been appointed engineer of electrical tests.

DONALD MCDONALD, manager of the Louisville Gas & Electric Co., has been elected president of the Louisville Industrial Foundation for the coming year.

CLIFTON W. WILDER, Brooklyn, N. Y., electrical engineer for the Public Square Commission, has resigned. It is understood that Mr. Wilder will become associated with the New York Edison Co.

O. A. ROFELTY, manager of the credit department of the Minneapolis General Electric Co., has resigned to become manager of the Sioux Falls (S. Dak.) division of the Northern States Power Co. He succeeds N. C. Draper, who has retired from the management on account of ill health.

PAUL J. WILKINS, formerly connected with the Electric Appliance Co., has severed his connection with the company and has established an illuminating engineering office at 1188 Oak street, Columbus, Ohio.

A. C. CALLAN, representing Walter A. Zelnicker Supply Co. St. Louis, announces the opening of a branch office at 719 L. C. Smith building, Seattle, Wash., to handle locomotives, rails, equipment, iron and steel.

JOHN F. NEALIS, who recently received his discharge from the Aero Observers branch of the service, is now associated with the Powdered Coal Engineering & Equipment Co. of Chicago, as advisory engineer. Mr. Nealis formerly had charge of research work for the U. S. Steel Corporation.

CHARLES L. SPAULDING, resident engineer, electric zone of the New York Central Railroad, with headquarters at New York City, has become secretary and engineer to the Yonkers (N. Y.) Water-Front Commission. In 1914 Mr. Spaulding became resident engineer in charge of construction work on four tracking and grade-crossing elimination and new station buildings in the electric zone of the New York Central from the Grand Central Terminal to Harmon.

C. L. LIEBAU has been elected vice-president and treasurer of the Decatur Malleable Iron Works, Decatur, Ill., succeeding Irving A. Sibley, who has disposed of his holdings in the company to Mr. Liebau. Mr. Sibley expects to return to his former home in South Bend, Ind. Mr. Liebau has recently resigned his position as general manager of the Vermilion Malleable Iron Works at Hoopeston, Ill. According to D. E. Willard, president of the Decatur Malleable Iron Works, that company is planning extensions which will double the capacity of the plant.

K. T. LONG, assistant electrical engineer and superintendent of the Chinese Telephone Administration, Tientsin office, has resigned to become the assistant general manager of the China Electric Co., Ltd., Peking and Shanghai, China.

G. K. KELLER, formerly associated with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has joined the sales force of the Knox-Andresen Co., Pittsburgh, Pa.

COL. HENRY WILSON HODGE, assistant chief engineer of the American Expeditionary Forces, and former member of the New York Public Service Commission, who has been in France since 1917, returned to this country on the U. S. S. President Grant which arrived Jan. 23. Colonel Hodge has announced his intention of resuming as an engineer in private practice.

M. M. STOWELL, well known in local electrical circles, has engaged in the general contracting business and will open an electrical appliance store at Virden, Ill. Mr. Stowell has had a vast experience in the electrical field, having formerly held important positions with large public utility companies and conducted a company, supplying electrical energy to a small town.

PROF. HERMAN W. REYNOLDS, associate professor of engineering at the University of the Philippines, Manila, is on a tour of the larger engineering colleges of the United States. He has been sent by the bureau of insular affairs and is especially interested in conducting an investigation on industrial engineering in connection with his work at Manila.

PAUL CAMPBELL has been appointed factory manager of the Electric Service Supplies Co., Philadelphia. During the year 1918 Mr. Campbell was connected with the New York district office of the Bureau of Aircraft Production as a special investigator of production problems in the New England states, previously having been production manager for the James Cunningham Sons & Co., Rochester, N. Y., and superintendent of the F. B. Stearns Co., Cleveland.

B. E. PARKER, of Evansville, Ind., has been appointed general superintendent of railways of the Northern Ohio Traction & Light Co., with headquarters at Akron, Ohio. Mr. Parker occupied a similar position with the Evansville Public Utilities Co., and was superintendent of transportation of the Rockford (Ill.) system before that time. He began his career as an electric railway worker in April, 1890, as a conductor at Muskegon, Mich. Removing to Marion, Ind., some years later, he soon became local superintendent of the Union Traction Co. in which position he remained until 1911, when he went to Rockford.

H. W. CROZIER, mechanical and electrical engineer for Sanderson & Porter, has been named a trustee of the Mechanics Institute of San Francisco, Cal.

L. W. HENCH has resigned his position as power sales engineer of the Mahoning & Shenango Railway & Light Co., Youngstown, Ohio, to become general sales manager of the International Oxygen Co., New York.

N. M. HARALSON, who since September, 1917, has been connected with the Bureau of Aircraft Production, and who has been chief of the instrument department of the New York office since June 1918, has resigned his position to become connected with the Haralson Sales Co., Inc., 752 Brown Marx building, Birmingham, Ala., in the capacity of sales engineer.

MORTIMER FREUND, who has been in charge of the Trench Warfare Branch, Loading Section of the Explosives and Loading Division, Ordnance Department, at Washington, D. C., has resigned from that service and has resumed his activities in the firm of Eadie, Freund & Campbell, consulting mechanical and electrical engineers, New York City.

Obituary.

WALTER HOLT BABCOCK, Brooklyn, N. Y., formerly associated with the New York Edison Co., died on Feb. 6 at his home, 1436 President street, of heart disease. Mr. Babcock was 29 years of age.

JOHN H. GREER, president and treasurer of the Fisher-Chase Manufacturing Co., Inc., Columbia, Ohio, died on Jan. 17 at the Hotel Breslin, New York, of pneumonia which followed an attack of influenza. He was about 36 years of age and had been connected with the Fisher-Chase company since its foundation in April, 1917. The deceased is survived by his wife and four children. Interment was made in Maryville, Tenn.

CHARLES S. HALL, treasurer and general manager of the William S. Hall Electric Co., supply jobber of Dayton, Ohio, died on Feb. 15 at Miami Valley Hospital in that city. Mr. Hall's death was very sudden and a great shock to his many friends and acquaintanies. Apparently in the best of health, but a few days before he was taken to the hospital for intestinal trouble and an operation performed on Saturday, from which he did not recover. Mr. Hall is well known throughout the jobbing field in the Middle West, having been associated as an official of the above company, which is one of the largest in Ohio, for the past ten years. He was an active fraternal man, having been a member of 21 fraternal orders, among which were the Masons, Elks and Rotarians and other prominent organizations.

For the Readjustment Period—What?

XXV.

This is the Talk!

Frank A. Vanderlip recently said concerning the coming year:

> "Great activity in business is inevitable. It is only a question of organization and spirit. We have the natural resources; we have a well-knit, happy and resourceful people; have a tried industrial organization with marvels of accomplishment to its credit; the world looks to us for our products. Shall problems of readjustment and reconstruction destroy our progress and defeat our resolution? It is inconceivable. All that we need is individual courage and confidence. The belief in prosperity is its creation."

I believe that an era of great prosperity is at hand—a period of industrial expansion and building activity. War plants will be adapted to the production of articles of peace; plants denied permission during the war will now expand; new factories and shops will be built.

Westinghouse, Church, Kerr & Co. has turned its efforts to the works of peace again and we are prepared to assist in the design and construction of industrial buildings of every character, power plants, railroad shops and terminals.

HENRY H. KERR,
Vice-President.

Mr. Vanderlip and Mr. Kerr have undoubtedly struck the keynote of the situation. Let those who believe this show in their talk and their actions that they do.

C. A. TUPPER, *President* — CHICAGO — INTERNATIONAL TRADE PRESS, Inc.

Financial News

Public Utilities Must Have Incentive.

H. H. Corey, public service commissioner of Oregon, recently stated:

"My experience with utility regulation teaches me that some broad-gauged plan must be devised in order to encourage the construction of new utilities in many communities not now served and to encourage present utilities to reach the maximum of efficiency in operations, which also tends to a lower average price of its product.

"One of the most vital points in the regulation of public utilities is found in the rate of return allowed on the investment."

He further expressed the opinion that public utility rates should be not only based upon rate-making values but to be equitable should give due regard to management efficiency and capabilities manifested of giving maximum benefit to communities served and to the utilities themselves. He added:

"Recognition of the principle accepted generally as proper and right, that the seller shall be entitled to a larger profit, if by any device he can give to the buyer a larger value for the unit price, should be applied in the fixing of public utility rates.

"The greatest benefit to all concerned cannot be attained if the utility is restricted in its earning capacity to a fixed rate of return on the physical value of its plant alone, because when a given utility has reached its maximum earnings allowed under such rate, those who are responsible for its operation will naturally relax their efforts toward greater economies and greater volume of sale. Some incentive should be held up to the management for further effort if the community interests are to be kept protected."

Cleveland Electric Illuminating Bonds Offered.

The National City Co. and Spencer, Trask & Co. are offering $2,500,000 first mortgage 5% gold bonds of the Cleveland Electric Illuminating Co. at 94½ to yield about 5.45%. These bonds are dated April 1, 1909, with interest payable April 1 and Oct. 1, and become due April 1, 1939. The Cleveland Electric Illuminating Co. serves with electric light and power the city of Cleveland and adjacent territory, embracing a total present estimated population of 1,000,000. The bonds are secured by an absolute first mortgage on the entire property of the company, as set forth in the mortgage. The property of the company includes electric generating stations, with a present aggregate installed capacity of 138,000 kw., which is now being increased to 188,000 kw., 10 modern substations, and over 7000 miles of overhead distribution lines connecting with 122,000 consumers. The value of the property on the basis of a valuation of the Public Utilities Commission of Ohio, and subsequent construction expenditures, is in excess of $30,000,000, as compared with a bonded debt of $18,500,000, including the present issue.

Arkansas Company to Increase Capital Stock.

Application has been filed by President H. C. Couch and the board of directors of the Arkansas Light & Power Co. with the county and probate clerk to increase the capital stock of the company $1,750,000. The Arkansas Light & Power Co. is at present capitalized for $2,250,000 and the proposed amendment to the articles of incorporation calls for a capitalization of $4,000,000. There will also be 25,000 shares of common stock and 15,000 shares of preferred stock, as against 15,000 shares of common and 7500 shares of preferred at the present time. It is said that the increased capital of the local company is to provide for the consolidation of the Arkansas Public Service Co., of Stuttgart, and extensive improvements and repairs in the rice company. The officers of the company are H. C. Couch, president, and H. C. Couch, J. L. Longino, C. S. McCain, J. F. Mullins, J. H. Meek, W. C. Ribenack and A. Berlig, directors.

Southern California Edison Co. has been granted authority by the Railroad Commission of California to issue, at not less than par, for a term of one year or less, $626,500 face value of notes, bearing interest at not to exceed 6% per annum, for the purpose of refunding or renewing the notes in question.

Great Western Power to Issue Note.

The Railroad Commission of California in a recent decision granted the Great Western Power Co. of California authority to issue a six-months 6% $350,000 promissory note for the purpose of refunding the $350,000 of indebtedness payable to the Bankers Trust Co. of New York, and upon the maturity of the note authorized, refund or renew the note through the issue of a six-months $350,000 promissory note bearing interest at not to exceed 6% per annum.

GENERAL GAS & ELECTRIC CO.
(Subsidiaries.)

A preliminary statement of gross earnings for the month of January, 1919 and 1918, and comparison, follows:

System.	1919.	1918.
Rutland	$ 47,467.57	$ 42,490.98
Northwestern Ohio	22,200.00	19,277.18
Sandusky	46,942.16	49,890.08
Binghamton	40,062.55	35,241.25
Sayre	11,383.75	10,694.78
New Jersey	29,184.32	21,645.64
Interurban Gas Co.	924.70	762.37
Totals	$198,165.05	$180,002.28

Preliminary statement of gross earnings:

Company or System.	January, 1919.	1918.
Reading Tr. & Lt. Co.	$198,579.27	$157,041.99
Met. Edison Co.	195,009.00	162,494.13
Penn. Ut. System	165,639.69	134,800.75
Combined	$559,218.96	$454,336.87

DAYTON POWER & LIGHT CO.

	December, 1918.	1917.	12 mos. ended Dec. 31, 1918.	1917.
Gross earnings	$267,800	$207,144	$2,430,729	$1,880,618
Operating expenses (including depreciation and taxes)	167,363	142,092	1,661,951	1,266,545
Net earnings	$100,437	$ 65,052	$ 768,778	$ 614,073
Non-operating revenue	3,511	1,056	33,301	10,334
Total income	$103,948	$ 66,108	$ 802,079	$ 624,407
Interest on bonds	$ 32,192	$ 15,121	$ 353,510	$ 181,620
Other deductions (includes other interest and sinking fund)	13,259	10,873	146,653	124,358
Total deductions	$ 45,451	$ 25,994	$ 500,163	$ 305,978
Net income	$ 58,497	$ 40,114	$ 301,916	$ 318,429
Dividend on preferred stock	15,381	14,813	179,552	177,750
Surplus	$ 43,116	$ 25,301	$ 122,364	$ 140,679
Operating ratio	62.49%	68.60%	68.37%	67.35%

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Feb. 11.	Bid Feb. 18.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	6	10	13
Adirondack Electric Power of Glens Falls, preferred	6	70	72
American Gas & Electric of New York, common	10+extra	98	98
American Gas & Electric of New York, preferred	6	43	43
American Light & Traction of New York, common	..	237	240
American Light & Traction of New York, preferred	6	98	98½
American Power & Light of New York, common	4	57	57
American Power & Light of New York, preferred	6	75	75
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	7	34	34
American Telephone & Telegraph of New York	..	100⅞	101
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip.	7	10	10
American Water Works & Elec. of New York, first preferred	..	58	56
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	13	14
Cities Service of New York, common	+extra	316	320
Cities Service of New York, preferred	6	80½	80½
Commonwealth Edison of Chicago	8	112	111½
Comm. Power, Railway & Light of Jackson, common	..	19	19
Comm. Power, Railway & Light of Jackson, preferred	6	41	40
Federal Light & Traction of New York, common	..	8	11
Federal Light & Traction of New York, preferred	..	39	39
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	20	20
Middle West Utilities of Chicago, preferred	6	50	50
Northern States Power of Chicago, common	..	65	69
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	48	50
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	88	88
Public Service of Northern Illinois, Chicago, preferred	6	88	88½
Republic Railway & Light of Youngstown, common	4	16	16
Republic Railway & Light of Youngstown, preferred	6	53	54
Standard Gas & Electric of Chicago, common	..	27	21
Standard Gas & Electric of Chicago, preferred	6	43	37
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	2¼
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12	13
United Light & Railways of Grand Rapids, common	4	36½	36
United Light & Railways of Grand Rapids, preferred	6	68	69
Western Power of San Francisco, common	..	18½	18
Western Union Telegraph of New York	extra	87	87
Industries—			
Electric Storage of Philadelphia, common	4	55½	58½
General Electric of Schenectady	8	146½	150
Westinghouse Electric & Mfg. of Pittsburgh, common	7	41	42
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55